

Comparative Study Of Synthetic Oil And Mineral Oil On The Basis Of Physical Characteristics

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Abstract

Petroleum oils are insufficient in lubricating our engines since they are made of refined substance, since some of the chemicals present in conventional petroleum oil break down at temperatures within the normal range usually around 325 to 250 degree Fahrenheit. Synthetic Oil outperforms all brands of petroleum oil in every aspect, but the best benefit we can derived from continuous use of synthetic oil is the extended life of your vehicle. Synthetic oil will make your engine last longer that petroleum oil through its continuous use. Throughout its history, the diesel has been the subject of a great deal of research and development. This work has focused on comparative study of physical properties Synthetic Oil and Mineral Oil.

1. INTRODUCTION

The ready availability of inexpensive middle-distillate petroleum fuels provided little incentive for experimenting with alternative, renewable fuels for diesel engines. However, since the oil crisis of the 1970s, research interest has expanded in the area of alternative fuels which are capable to give the high efficiency. So these needs are make our attention towards invention and analysis of best use of alternative fuel blends and switching synthetic lubricating oil for higher efficiency of diesel engine.

The perfect lubricant would have no friction, allow no wear and be able to operate at any temperature for any length of time without any change in its properties. The place for synthetics is somewhere between the finite limitations of mineral oils and perfection. To be commercially viable a synthetic product must:

- Meet a need which a mineral oil cannot,
- Show an economic benefit in operation.

Early developments in 'synthetic lubricants primarily addressed the need to provide some performance characteristic unattainable with mineral oils. In the last decade or so, field experience has shown that certain types of synthetics can give Economic benefits when used in place of mineral oils which were working satisfactorily. Organic esters were developed in the 1940's in response to a military need for lubricants which would perform satisfactorily at high temperatures and still remain fluid at low temperatures. Much current research is aimed at lubricants that can function at temperatures far higher than either mineral oils or most current synthetics can survive. Our research is improving our understanding of the relationship between these benefits and the physical and chemical properties of the synthetics leading to an optimization of the synthetic.

2. WHAT IS SYNTHETIC OIL?

The term 'synthetic fuel' has several different meanings and it may include different types of fuels. More traditional definitions, e.g. definition given by the International Energy Agency, define 'synthetic fuel' as any liquid fuel obtained from coal or natural gas. The Energy Information Administration defines synthetic fuels in its Annual Energy Outlook 2006, as fuels produced from coal, natural gas, or biomass feedstock's through chemical conversion into synthetic crude and/or synthetic liquid products.[5] A number of synthetic fuel's definitions include also fuels produced from biomass, and industrial and municipal waste. The definition of synthetic fuel also allows oil sands and oil shale as synthetic fuel sources, and in addition to liquid fuels, synthesized gaseous fuels are also considered to be synthetic fuels. Conventional motor oil as we have known it for the last 100 years or so is derived from crude oil that is taken from the earth with oil wells. Through a complex distillation process the crude oil is refined into many different liquids or fractions each having its own characteristics. Some are very light and are used as fuel (Gasoline, Kerosene, & Diesel Fuel). And some are heavier and are used as lubricants (Motor Oil, Gear Tube, and Grease). There are many

molecular compounds present in crude oil and many of those compounds are still present in the refined product. Detracting from the physical properties of that product. For instance, paraffinic waxes are present in crude based oil, but contribute nothing to lubricant properties of the oil. Also, the size of the hydrocarbon molecules themselves is nonuniform in crude-based oils. Synthetic oil contains none of these contaminants and the hydrocarbon molecules are very uniform. Giving the synthetic oil base better mechanical properties at extreme high and low temperature (see the sections below on physical properties). By contrast, synthetic oil is not distilled from crude oil. It is made through a chemical process known as the Fischer-Tropic process, starting with raw materials like methane, carbon monoxide, and carbon dioxide. This process was developed by Germany in WWII. When that country's access to crude oil was very limited.

3. NEED FOR SYNTHETIC ENGINE OILS

There are only three reasons for a consumer to use synthetic or partial synthetic engine oil:

- i.) It solves a technical problem.
- ii.) Its use results in improved economics.
- iii.) Governmental regulations

Technical requirements 'may involve using synthetics to satisfy high or low temperature proper- lies, to improve oil durability, or to improve engine test performance. In Europe, the addition of PAO and ester base stocks has allowed oil formulators to increased thermal oxidative stability requirements and to achieve improved volatility specifications and better low temperature start- in. In North America. OEMs are requiring more stringent lubricant performance in engine clean- lines, as well as improved volatility and low temperature pumping-starting. OEMs are starting to specify synthetic engine oils for some high performance applications (e.g., GM's Chevrolet Corvette). Full synthetic arctic engine oils have been used by the U.S. military, NATO, and civilian companies since the early 1970s for equipment serving in extreme cold weather conditions MIL-L-46167B). The use of synthetics in engine oils has just started to show economic justification in the mar- replace. The consumer--whether an individual with a passenger car, a lease company with return vehicles, or a business with a fleet of trucks is beginning to recognize the economic advantage of increased engine life that is associated with the use of high performance oils. This advantage can be shown for extended vehicle service or residuals on resale.

High performance, heavy-duty diesel engine oils are under development and testing to extend the oil drain interval and to lower maintenance costs, while maintaining or increasing engine operating life. Synthetic components (PAO, digester, polygon esters) are being evaluated in conjunction with high performance additive systems for this "next generation" HDDO. These components are being added at 530 with petroleum base stock for' enhanced additive and by product solubility which improved engine cleanliness, good isometric properties and lower oil volatility. Worldwide, government

regulations are starting to reflect concerns with vehicle fuel usage and the environmental impact of the products of the internal combustion engine. These regulations are affecting vehicle and engine design and formulations for the lubricants used in these vehicles. Fuel economy has been subject to government guidelines since the 1970s (CAFE in the United States). Heavy-duty diesel emissions guidelines in 1978, 1994, and 1998 in North America and corresponding requirements in Europe and the Far East are changing the engines and oils. All these requirements are designed to promote more efficient energy usage and to diminish the environmental impact of these engines.

4. PERFORMANCE BENEFITS WITH SYNTHETICS

In order to be commercially viable as a mineral oil replacement, a synthetic must be able to give a reasonable return for the additional investment. Principal benefits cited in the review were labor and material savings, reduction in power requirements, reduced failure rates and elimination of cold weather starting problems. The benefits of various types of synthetics in industrial applications were also recently reviewed by Miller (1984). In the introduction to the current paper, five general areas of performance benefit for synthetics were listed. These areas will be discussed in more detail in the following subsections, with emphasis on the property differences which give the benefit. The advantages of using synthetic motor oils include:

- i.) Better low- and high-temperature viscosity performance at service temperature extremes;
- ii.) Better (higher) Viscosity Index ;
- iii.) Better chemical and shear stability ;
- iv.) Decreased evaporative loss;
- v.) Resistance to oxidation, thermal breakdown, and oil sludge problems[citation needed]
- vi.) Extended drain intervals, with the environmental benefit of less used oil waste generated;
- vii.) Improved fuel economy in certain engine configurations;
- viii.) Better lubrication during extreme cold weather starts;
- ix.) Possibly a longer engine life;
- x.) Superior protection against "ash" and other deposit formation in engine hot spots (in particular in turbochargers and superchargers) for less oil burn off and reduced chances of damaging oil passageway clogging;
- xi.) Increased horsepower and torque due to less initial drag on engine;
- xii.) Improved fuel efficiency - from 1.8% to up to 5% has been documented in fleet tests.

5. PHYSICAL CHARACTERISTIC TESTS

For Comparative analysis of the physical properties of the synthetic and petroleum oil. We are going to conduct some tests that deal with the characteristics and physical properties of the oil. This test conclude about the reliability, friction reducing tendency cold working ability, alkalify level, wide temperature range, flow ability of oil, higher load stability of the both oils. So we come out to know about worst condition the oil can be used and able to perform satisfactorily. For that purpose we collected four samples of

oil with the 10W40 grade as follow:

Fresh Pure petroleum oil

3000 km used petroleum oil

Fresh pure synthetic oil

15000 km used synthetic oil



Figure 1- Samples

The used oil samples are collected because as the oil is used for certain kilometers it loses its ability to lubricate an engine and the performance reduces. Our aim is to show that 15000 KM used synthetic oil shows better results than 3000 KM used petroleum oil so the comparative data will analyses through following tests which carried out others four samples:

- i.) Flash Point test.
- ii.) Pour point test.
- iii.) Knock volatility test.
- iv.) Total Base Number test

5.1 Flash and Fire Point Test

Aim: To determine the Flash and Fire point of Four oil samples of oil.

Scope: Many times the flash point and fire point of an ignitable liquid (like oil) is a key consideration in fire case litigations, I.C. engine. Litigation in fire or explosion incident cases is often a matter of the relative flammability of the oils involved. When oil flammability characteristics become the main issue at the heart of litigation, the subject of "material science" comes into play. Materials science deals with the various properties and characteristics of substances, particularly with those characteristics which have an impact on their use by a consumer.

Result: The Result table and comparative graphs are as below.

Table 1: The Result table

No.	[1] Sample	[2] Flash point test	[3] Fire Point test
1.	[4] Synthetic Oil	[5] 280	[6] 300
2.	[7] Synthetic Oil (15000 Kilometers used)	[8] 180	[9] 200
3.	[10] Petroleum oil	[11] 200	[12] 220
4.	[13] Petroleum oil (3000 kilometers used)	[14] 100	[15] 120

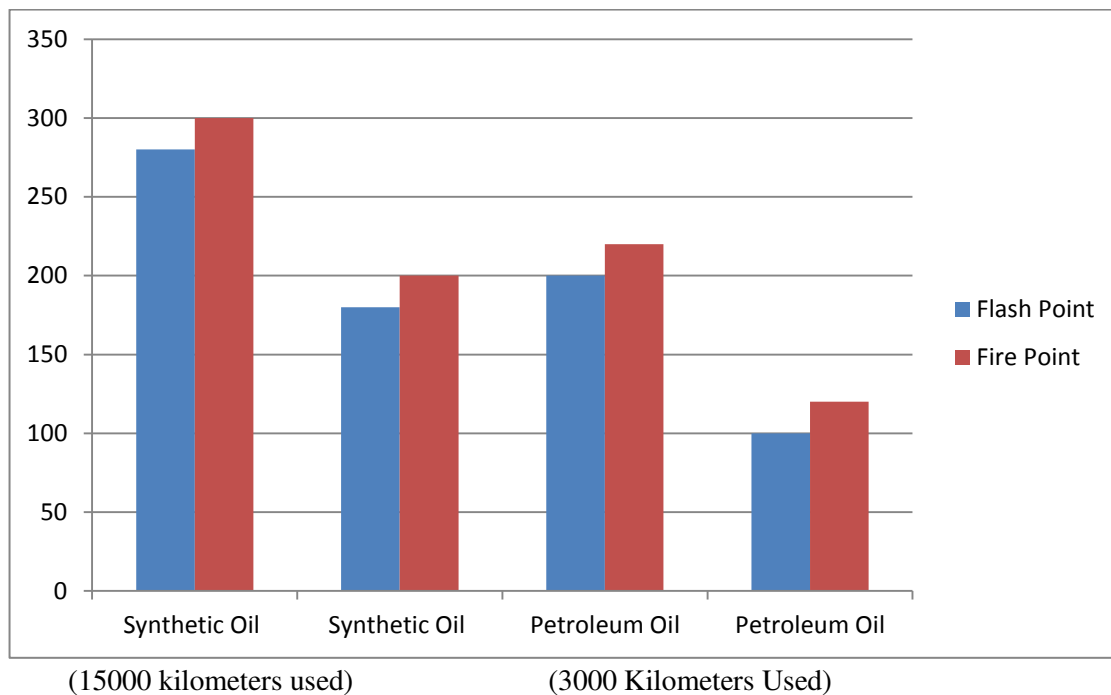


Figure 2: Graph Samples V/s. Temp

Remark: From the above test results we are concluded that the Synthetic oil has large flash and fire point than conventional petroleum oil which proof that synthetic oil can be chemically stable up to 300 degree cell and the rate of vaporization of this oil is very low. As well as we compare flash point and fire point of used oil which also indicate that 15000 kilometres used synthetic oil have still more flash point then 3000 km used petroleum oil. This test is ultimately conclude about rate of ignition of 15000 km used synthetic oil is even higher and will not contributes to any_ hazards and fire condition of I.C. engine. So the synthetic oil can be used at worst engine condition and higher engine temperature and synthetic oil will not lose its chemical properties up to 15000.

5.2 Pour point test

Aim: To determine the pouring capacity of oil at lower temperatures Scope

Pour point: In petroleum products, the lowest temperature at which movement of the test specimen is observed under prescribed conditions of test. The Pour Point is the lowest temperature at which the oil can still be poured out of a container.

Pour point is important in order to find out the properties of oil at lower temperature and chemical behavior oil at certain low temperature. These properties will ensure the worst lower working condition of I.C. engine like faster cranking for easy start up, stain on battery & faster flow for engine start up etc.

Apparatus: We use deep freezer having the capacity produce -35°C temperature which is used to produce step reduction of temperature.

Result: The 100ml each sample is taking for the examination after 2hr of frizzing at different temperature.

Table 2(i, ii, iii): The Pour Point Results

(i) At the 0⁰ temperature.

No.	[16] Sample	[17] ml of oil flow out after 6 min
1.	[18] Synthetic Oil	[19] 100
2.	[20] Synthetic Oil (15000 kilo meters used)	[21] 98
3.	[22] Petroleum Oil	[23] 98
4.	[24] Petroleum oil (3000 kilo meters used)	[25] 98

(ii) At the -20⁰ temperature

No.	[26] Sample	[27] ml of oil flow out after 6 min
1.	[28] Synthetic Oil	[29] 90
2.	[30] Synthetic Oil (15000 kilo meters used)	[31] 84
3.	[32] Petroleum Oil	[33] 52
4.	[34] Petroleum oil (3000 kilo meters used)	[35] 47

(iii) At the -35⁰ temperature

No.	[36] Sample	[37] ml of oil flow out after 6 min
1.	[38] Synthetic Oil	[39] 70
2.	[40] Synthetic Oil (15000 kilo meters used)	[41] 60
3.	[42] Petroleum Oil	[43] 23
4.	[44] Petroleum oil (3000 kilo meters used)	[45] 15

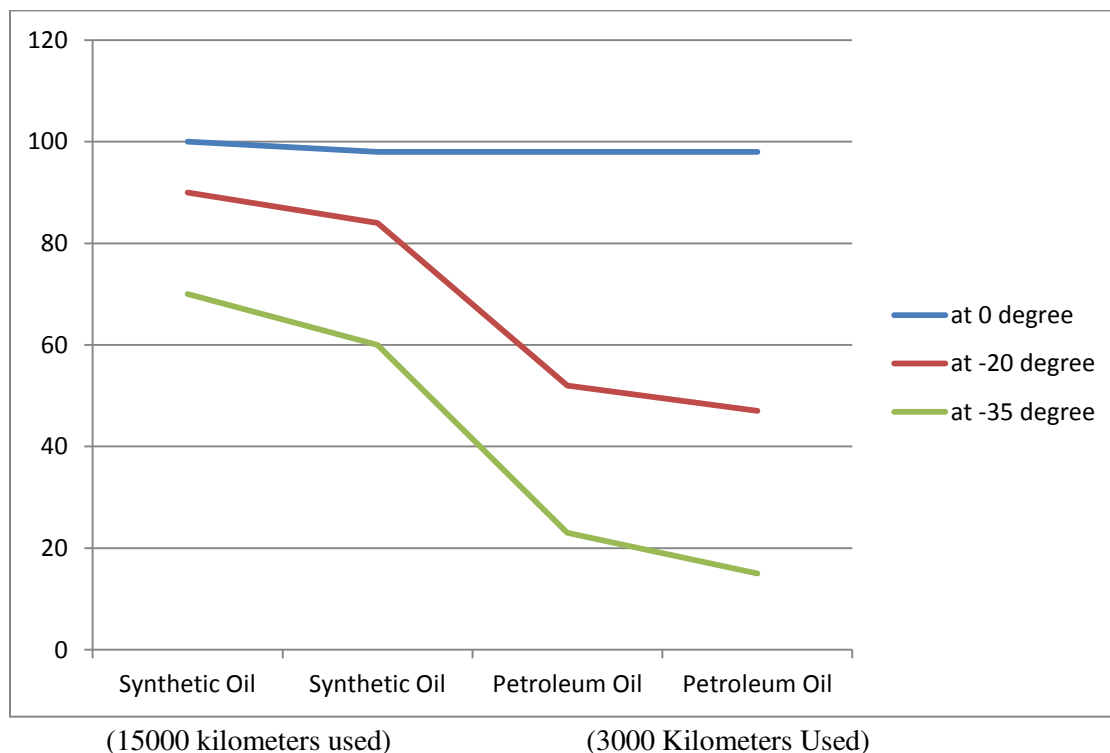


Figure 3: Sample vs ml of oil flow out

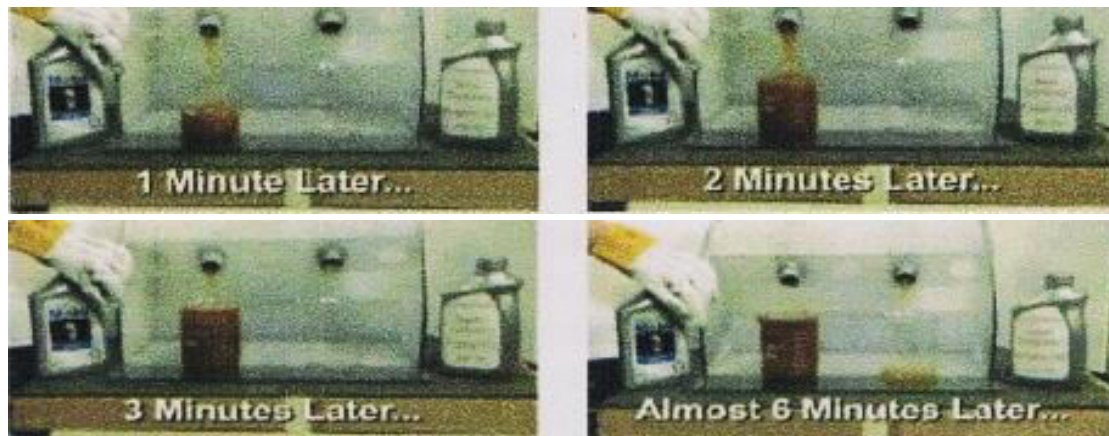


Figure 4: Samples

Remark: This test will concluded that at very lower temp like 0°:20°,-35" the synthetic oil still pour and convectional oil can't keep down. This will alternately conclude that synthetic oil can perform better at extreme low temp condition, this will also improve, faster cranking for easier start up 2, faster flow for faster engine warm up 3.less strain on battery.

5.3 Knock volatility test

Aim

To determine the knock volatility of oil samples.

Scope

The evaporation loss is of particular importance in engine lubrication. Where high temperatures occur, portions of oil can evaporate. Evaporation may contribute to oil consumption in an engine and can lead to a change in the properties of an oil. Many engine manufacturers specify a maximum allowable evaporation loss. Some engine manufacturers, when specifying a maximum allowable evaporation loss, quote this test method along with the specifications. Procedure C, using the Selby-Knock apparatus, also permits collection of the volatile oil vapours for determination of their physical and chemical properties. Elemental analysis of the collected volatiles may be helpful in identifying components such as phosphorous, which has been linked to premature degradation of the emissions system catalyst.

Result:

Table 3: The result table

No.	[46] Sample	[47] Weight lost in %
1.	[48] Synthetic Oil	[49] 70
2.	[50] Synthetic Oil (15000 Kilometres used)	[51] 60
3.	[52] Petroleum Oil	[53] 23
4.	[54] Petroleum oil (3000 kilometres used)	[55] 15

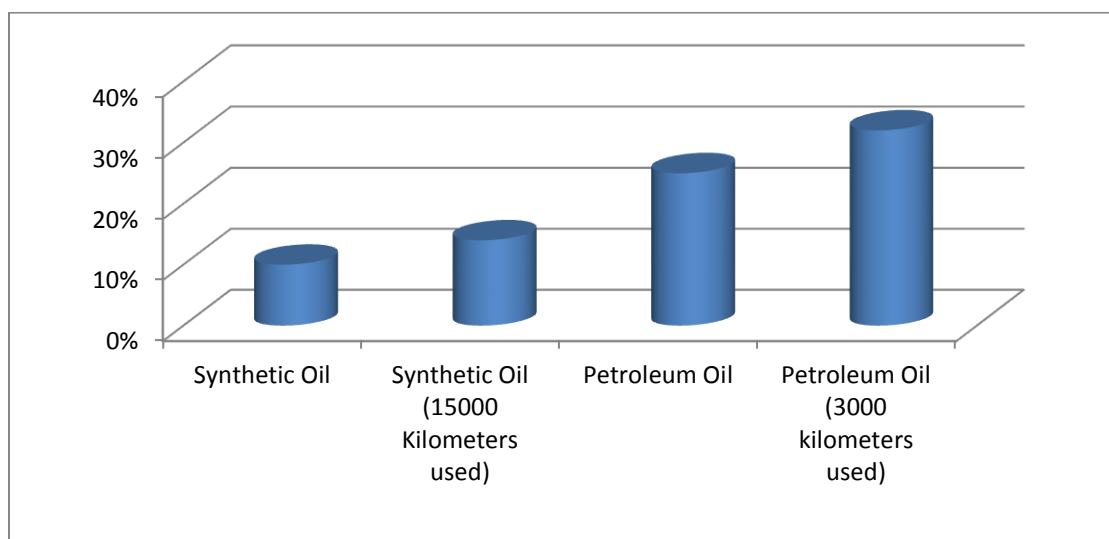


Figure 5: Comparative graphs

Remark

The test is concluded about oils volatility. And synthetic oil has less volatility so we can use this oil till 15000 km with very less loss of oil. It ensures the chemical stability of synthetic oil at 250°C. In the case of petroleum oil it vaporizes very faster than synthetic oil so it gives lower performance at very high temperature condition.

5.4 Total base number test (TBN test)

Aim: To determine the total Base Number of Four Oil samples of Oil.

Scope: TBN stands for Total Base Number. TBN is a measure of the oil's alkalinity. Alkalinity in oil is important because the combustion process produces acids which can attack metals and other materials in an engine, increasing wear. When oil is new the TBN is highest. Over time, TBN decreases until finally the oil reaches a point where it cannot absorb any more acids and the acidity of the oil in the engine will start to rise. Most often, it is this depletion of TBN which signals that an oil is 'worn out' and due to be changed. TBN is measured in milligrams of Potassium Hydroxide per gram (mg KOH/g).

In other words when we buy new engine oil_ it has a 'base reserve' built into the additive package. This is designed to neutralize the acids as they are produced with all acid base reactions. The 'base reserve' is used up in the process of neutralizing these acids.

This Base reserve is called the Total Base Number which is a measure of the level of BASE in the oil and is determined by measuring the amount of Potassium Hydroxide in mg taken to neutralize the base reserve in 1 gram of oil (mg KOH/g). TBN is measured in milligrams of Potassium Hydroxide per gram (mg KOH/g).

Results:

The result table and comparative graphs are as below:

No.	[56] Sample	[57] mg KOH/g
1.	[58] Synthetic Oil	[59] 12
2.	[60] Synthetic Oil (15000 kilo meters used)	[61] 9
3.	[62] Petroleum Oil	[63] 10
4.	[64] Petroleum oil (3000 kilometres' used)	[65] 9

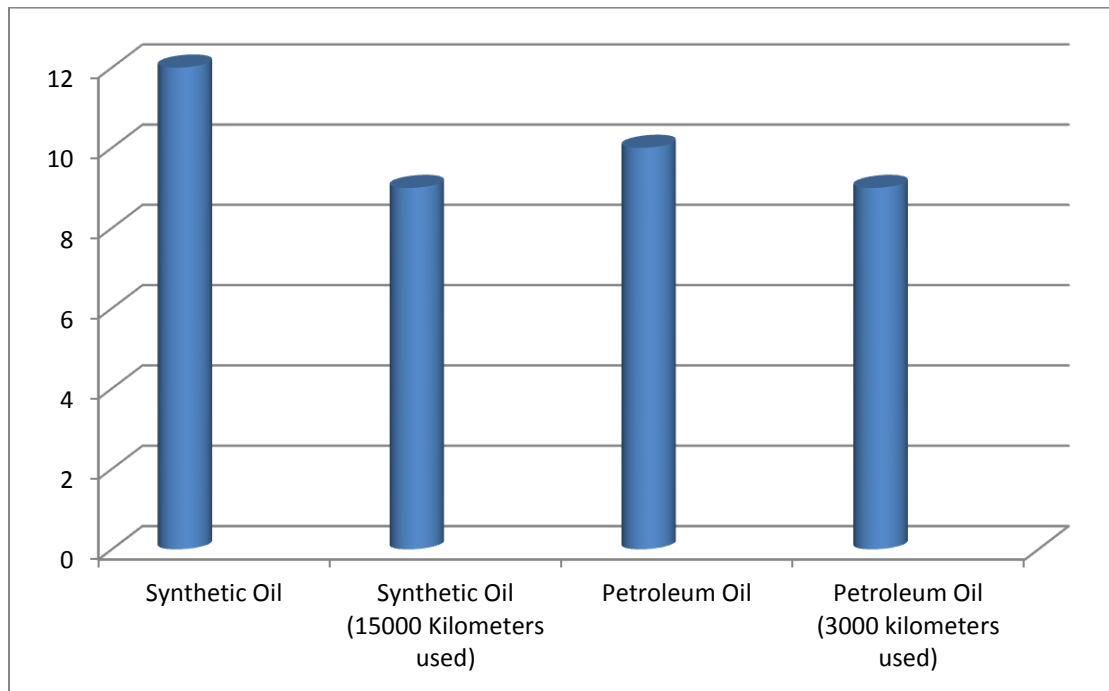


Figure 6: Graph samples vs. TBN

Remark

From the above test results we are concluded that the Synthetic oil has large Total Base Number then Petroleum Oil. The Fresh synthetic oil has Total Base Number of 12 and pure Petroleum oil has Total Base Number of 10 as well as we compare both used oils and conclude that the capacity of 15000 KM used synthetic oil to neutralize the acid is more than Mineral oil. Ultimately the test results are proved that the Synthetic oil is giving better maintainability of engine, as Synthetic oil has more capacity to absorb acids produced from combustion process of engine. So 15000 KM used synthetic oil having Total Base Number 9 will no effect on the internal metal structure of engine. On the other hand 3000 KM used Petroleum oil having Total Base Number is 5 which show that the capacity of Petroleum oil to neutralize acid is lower so the acid may attack on internal metal structure of IC engine.

6. CONCLUSION

It is beneficial to use synthetic oil then conventional petroleum oil. The advantage of synthetics over mineral oils comes from the ability to synthesize selected molecular structures which are beneficial in lubrication. This usually is only possible at some cost penalty and a synthetic product is only of value if it can more than repay the additional investment or provide some critical performance need which a mineral oil cannot. Performance factors which can lead to overall cost savings are improved energy efficiency, reduced maintenance costs, increased design ratings, improved reliability and safer operation. In addition, Performance beyond the capability of mineral oils can be obtained through a wider operating temperature range and the ability to operate in hostile environments. The introduction of teratology as a scientific discipline has helped make

these benefits more readily recognizable. The lubricant is an important engineering component, not an unfortunate afterthought, and its performance characteristics contribute to the overall economics of any design. Synthetics in widest use as mineral oil replacements due to better performance are synthetic hydrocarbons, polyglycols and esters. Synthetics which offer special properties at higher cost are phosphate esters, silicones, halogenated fluids and polyphenyl ethers. Ultimately we can use synthetic oil till 15000 km with minor loss of its physical properties which does not impact performance of engine lubrication.

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A Study On Health Food: Demand, Supply & Acceptance In Pune City

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Abstract

The main objective of the present study was to find out demand, supply and acceptance in the Pune city. The research design was descriptive in nature. Data was collected from different sections of the society. Questionnaire were prepared & distributed among doctors, engineers, professors, dieticians, workers & housewives. Pune city from Maharashtra state of India was selected for study. Seventy nine feedbacks were collected. Random sampling technique was used for collection of data. Health food was categorized in natural foods, organic food & whole food. The demand of the health food is increasing day by day because of its health benefits. Respondents were aware of health food items and health food vendors in city. Health food has better qualities than regular food. It is widely accepted by the people in Pune city. Natural food is more consumed by the people as compared to the organic food, whole food & less fatty food .

1. INTRODUCTION

Food is necessary for any organism live alive. Without food none of the living things can survive. Humans have understood the importance of the food & have done lots of researches in the field of food. Researches have been carried out from the micro level to macro level. It starts with cultivation to the harvesting of the crops. The important aspect of food is nutritional content. All nutrients are required to remain healthy. All the varieties of the food should be included in the regular meals. In market all type of convenience food are also available which are ready to eat or ready to cook food.

But all the food is not healthy to eat. There are some food which tastes very good but that is bad for health & there are some food which does not taste good but are very good for health. So it becomes necessary to understand the meaning of healthy food. Firstly, food should be

blemish free & in good condition. Secondly, naturally it should be grown, without using chemical fertilizers. Hybrid varieties give more yields but nutritional content is not really good. Naturally grown crops sometimes are not attractive but are healthier. Health food is food considered beneficial to human health in different ways that go beyond a regular healthy diet required for human nutrition. Foods considered healthy are natural foods, organic foods, whole foods, vegetarian and dietary supplements. These products are sold in health food stores and in the health/organic sections of supermarkets.

In this research paper researcher has covered four dimensions of health food. The study has been carried out in Pune city of India. Researcher has tried to find out meaning of health food. Second aspect is demand of health food items. How many people are aware of health food? Is health food easily available for people to buy? How many vendors or stores are selling health food? People who are already consuming health food are satisfied with the taste, appearance or nutritional content of health food.

2. OBJECTIVES OF THE RESEARCH

To study demand for health food

To examine supply of health food items available in the market

To find out acceptance level of people for health food

3. LITERATURE REVIEW

- **Dacina Crina Petrescu, and Ruxandra Malina Petrescu-Mag (2015)**, explored consumers' perceptions of organic food and examine whether organic food products are perceived in the North-West Region of Romania as offering health and environmental benefits or as simply another sine qua non condition to be integrated into the luxurious yuppie lifestyle. The inspiration for our study came from witnessing the stereotypical image of organic food consumers as "stylish, trendy, fancy consumers" in the last three to five years. Scientific evidence on the perceptions of organic food is based on a probabilistic survey. The results indicate an environmental consciousness of organic food consumers in North-Western Region of Romania in terms of organic food: a high percentage of consumers believe that organic food is healthier than conventional food (87%) and that it contributes to environmental protection more than conventional food (75%). A statistically significant difference ($p < 0.05$) was observed between people with higher education and those without higher education concerning the following beliefs: belief that most people consume organic products because they are in fashion, and belief that organic food contributes to environmental protection.
- **Sarah O. Rodman, Anne M. Palmer, Drew A. Zachary, Laura C. Hopkins, and Pamela J. Surkan (2014)**, discovered how organic food factors into low-income consumers' overall understanding of healthy eating, we analyzed 36 in-depth interviews with adults in Baltimore, Maryland. We asked participants to discuss their understanding of healthy eating. Unprompted, many participants discussed organic food or attributes commonly understood to define organic food. Some participants believed health issues

including cancer, weight gain, and allergies can arise from consuming nonorganic foods. Participants expressed that organic competes with other food attributes such as nutrient content in informing their perception of whether a food is healthy. Several voiced concern that nonorganic foods are responsible for weight gain and abnormal development. Our results show that despite limited access, organic is an important factor in some consumers' understanding of healthy food. Consumers' perceptions of organic can swamp or compete with other messages about healthy eating. Therefore, consumers' understanding of organic should be considered in developing diet-related messages and programs. [Food, organic, nutrition, diet, qualitative research, Baltimore]

- **Kristina Nelson, Lily Stojanovska, Todor Vasiljevic, and Michael Mathai (2013)**, stated that grains are global dietary staples that when consumed in whole grain form, offer considerable health benefits compared with milled grain foods, including reduced body weight gain and reduced cardiovascular and diabetes risks. Dietary patterns, functional foods, and other lifestyle factors play a fundamental role in the development and management of epidemic lifestyle diseases that share risks of developing adverse metabolic outcomes, including hyperglycaemia, hypertension, dyslipidaemia, oxidative stress, and inflammation. Whole grains provide energy, nutrients, fibres, and bioactive compounds that may synergistically contribute to their protective effects. Despite their benefits, the intake of grains appears to be lower than recommended in many countries. Of emerging interest is the application of germination processes, which may significantly enhance the nutritional and bioactive content of grains, as well as improve palatability. Enhancing grain foods in a natural way using germination techniques may therefore offer a practical, natural, dietary intervention to increase the health benefits and acceptability of whole grains, with potentially widespread effects across populations in attenuating adverse lifestyle disease outcomes. Continuing to build on the growing body of in-vitro studies requires substantiation with extended in-vivo trials so that we may further develop our understanding of the potential of germinated grains as a functional food.
- **Helena Siipi, (2013)**, stated in this paper the healthiness of food as food's accordance with nutritional needs of its eater. The connection of healthiness to the following five food-related senses of the term "natural" is analyzed: naturalness as nutritive suitability, naturalness as moderate need satisfaction, naturalness as lack of human influence, naturalness as authenticity, and naturalness as familiarity. It is concluded that some very common current uses of the term "natural," such as naturalness as lack of human influence, are not conceptually connected to the healthiness of food. Nevertheless, the first two senses of naturalness are strongly conceptually connected to healthiness in the food context and the last one may be indirectly related to it. Thus, desire for natural food is not necessarily mistaken and misguided.
- **Sang-Mook Lee and Naehyun (Paul) Jin, (2013)**, find out relationships among Knowledge of Healthy Food, Health Concern, and Behavioral Intention: Evidence from the United States and South Korea, This study explores the correlations among knowledge of healthy food, health concern, and behavioral intention among college students. This

study also examines the perception of these factors by students in the United States and South Korea. This study employed a distribution of 630 questionnaires, of which 550 (203 from the United States and 347 from South Korea) represent the dataset for analysis. The findings show that knowledge of healthy food had a significant effect on behavioral intention and positively affected health concern among college students in the United States and South Korea. In addition, health concern has a significant impact on college students' behavioral intention. Results also showed that the links among the three constructs were consistently important to the participating college students. Additionally, the moderating effect of culture differences on knowledge of healthy food and behavioral intention were observed

- **Sangmook Lee, Deborah Fowler, And Jessica Yuan, (2013)**, determined the characteristics of healthy foods as perceived by college students at a university in the southwestern United States. It was also undertaken in order to provide a more uniform, foundational framework regarding the definitions of terms used by researchers studying healthy foods and behavioral choices regarding healthy food. The results of this study validated the premise that healthy foods could be identified by classifying several features common to them, and that healthy food could then be defined using these characteristics: "low calorie foods" ($\alpha = 0.869$), "low fat foods & healthy drinks" ($\alpha = 0.764$), and "low cholesterol foods" ($\alpha = 0.734$). This study helped to classify the characteristics of healthy foods as perceived by college students, and this information could be used by college foodservice managers to develop healthier menu items, and also by researchers studying this population and/ or related marketplaces.
- **Venkat Raman Ganesh, (2013)**, analyzed life cycle of the processed food versus the whole food (Potato), The following report compares the energy inputs required for the processed food and whole food. The energy values are calculated considering many sectors and obtaining the energy equivalent of the each sector. Total energy is obtained by summing up the energy value of the individual sector. The value obtained is compared to the standard model value of the EIOLCA (d) model. Based on the model and its associated assumptions, the following conclusions can be drawn 1. The processed food consumes 2.3% energy more than natural food production. 2. The major portion of energy consumption is due to electricity and the energy consumption can be reduced by judicious usage of electricity. 3. The study shows the correctness between EIOLCA and analytical model. Answering the question requires spelling out the following: (1) What is meant by the healthiness of food? (2) What different conceptual meanings the term natural has in the context of food? (3) Are some of those meanings connected to the healthiness of food? In this paper the healthiness of food is understood narrowly as food's accordance with nutritional needs of its eater. The connection of healthiness to the following five food-related senses of the term "natural" is analyzed: naturalness as nutritive suitability, naturalness as moderate need satisfaction, naturalness as lack of human influence, naturalness as authenticity, and naturalness as familiarity. It is concluded that some very common current uses of the term "natural," such as naturalness as lack of human

influence, are not conceptually connected to the healthiness of food. Nevertheless, the first two senses of naturalness are strongly conceptually connected to healthiness in the food context and the last one may be indirectly related to it. Thus, desire for natural food is not necessarily mistaken and misguided.

- **Graeme Sherriff, (2009)**, piloted the Bentley Bulk local food initiative in Manchester in 2003 with the aim of creating a “Healthy Local Food System”. It combined education in food, training in horticulture and work on a local market garden with a food buying co-operative and placed these within the context of a local currency. It is argued that, by operating at the nexus of sustainability and justice, the project can be seen as an example of Just Sustainability in the UK. Just Sustainability provides a framework for a discussion of the issues in taking the project from theory into practice. In particular, the paper looks at the challenge of reaching out to the “non-usual suspects”, making organic food more socially inclusive, linking community projects with larger-scale environmental issues, and the ethics of volunteering.
- **Philip Sloan, Willy Legrand, Joseph S. Chen (2008)**, stated that study seeks to discuss the reasons why the youth make healthy food choices. It presents a conceptual model based on social cognitive theory, stages of change theory, and trans-theoretical theory for understanding factors that influence young people’s dietary and health behavior. This model purports to conceptualize eating behavior as a function of individual and environmental influences.

4. RESEARCH METHODOLOGY

The research design is descriptive in nature. Data was collected from different sections of the society. Questionnaire were prepared & distributed amongst doctors, engineers, professors, dieticians, workers & housewives. Pune city from Maharashtra state of India was selected for study. Seventy nine feedbacks were collected. Random sampling technique was used for collection of data.

5. DISCUSSION

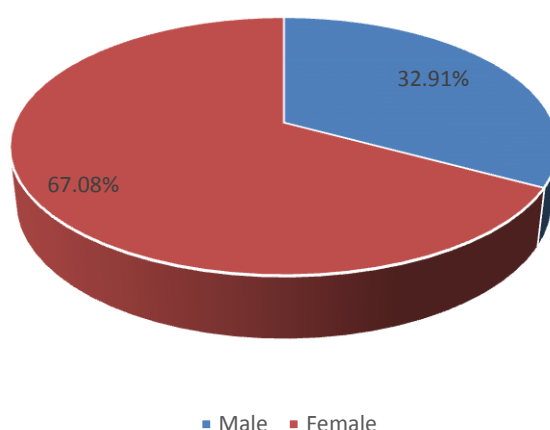
Health food can be categorized in natural foods, organic food & whole food. Natural food is often considered to imply foods that are minimally processed and all of whose ingredients are natural products. No chemical are added & only the form of food is changed without changing the content food. Organic foods are foods produced by organic farming. Organic farming in general features cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity. Synthetic pesticides and chemical fertilizers are not allowed, although certain approved pesticides may be used. In general, organic foods are also not processed using irradiation, industrial solvents, or synthetic food additives. Foods produced with natural resources are considered to be healthier. Whole foods are foods that are unprocessed and unrefined, or processed and refined as little as possible, before being consumed. Whole foods typically do not contain added salt, carbohydrates, or fat. It includes unpolished grains, beans, fruits,

vegetables, and animal products, including meats and non-homogenized dairy products. Whole Food was defined as ‘Mature produce of field, orchard, or garden without subtraction, addition, or alteration grown from seed without chemical dressing, in fertile soil manure solely with animal and vegetable wastes, and composts and ground, raw rock and without chemical manures, sprays, or insecticides. Diets rich in whole and unrefined foods, like whole grains, dark green and yellow/orange-fleshed vegetables and fruits, legumes, nuts and seeds, contain high concentrations of antioxidant phenolic, fibers and numerous other photochemical that may be protective against chronic diseases. A diet rich in a variety of whole foods has been hypothesized as possibly anti-cancer due to the synergistic effects of antioxidants and phytochemicals common in whole foods.

On one side peoples are becoming more health conscious and on the other side, because of increase in population demand for food is increasing but we have the same resources available for the farming. So many farmers are trying to increase their production & eventually increase in income. Farmers have started using hybrid varieties of crops which gives more yield compared to traditional varieties. Hybrid crops required more nutrition which is not available in our soil. Along with that it is always infected by many diseases. Required nutrition is provided to crops through chemical fertilizers & disease is eradicated by using chemical pesticides. Some consumers are particular about the appearance of the food. They prefer polished cereals & pulses, yellow bananas, big & very green leafy vegetables, fatty meat products etc. These people are really not worried about the content or consequences of such food. The food which looks better sales the most but there is one segment of people who are not bothered about the appearance of the food. They prefer natural food which is not great look wise but is very healthy. There are many places or stores where this kind of health food is available. Comparatively rate of food is bit more. Organic vegetables & fruits are in supermarkets also.

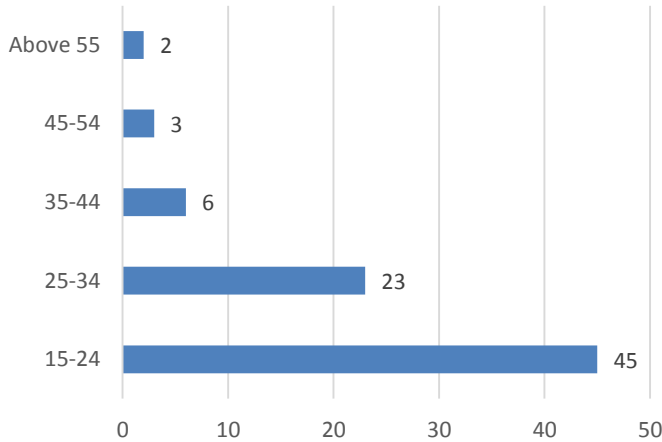
6. RESULTS & ANALYTICAL FINDINGS

1. Gender of respondents:



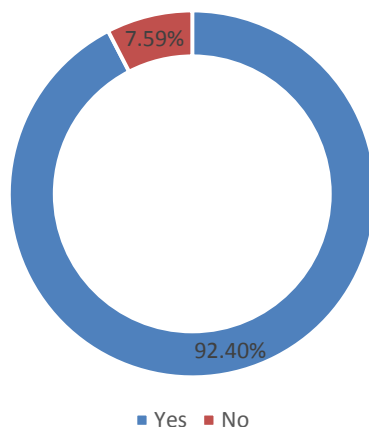
Women are more conscious about their health and familiar with all kind of foodstuff available in the market that is why more feedbacks were taken from the women. Around 67 percentages of the respondents were females.

2. Age of respondents:



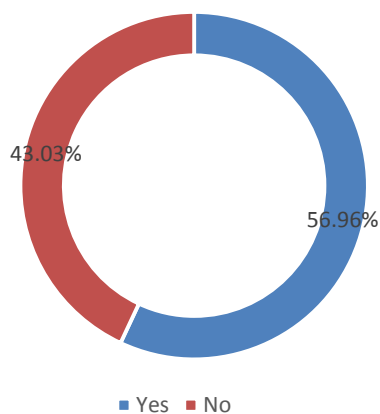
Now a days youngsters are also very particular about the food they eat so more of the feedbacks are taken from the respondents whose age is between 15- 24 years.

3. Knowledge about health food:



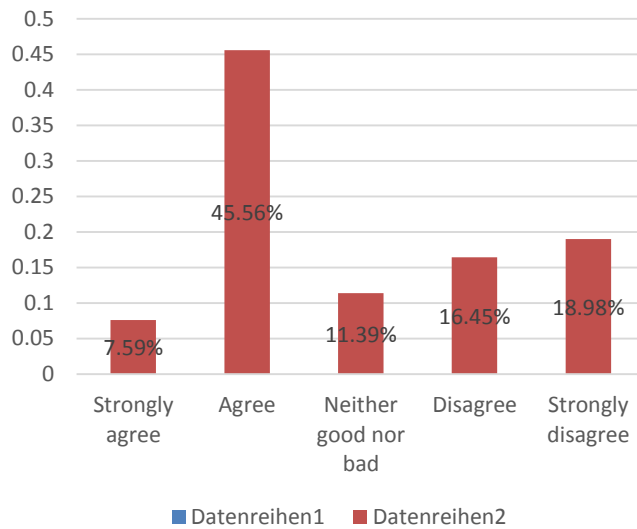
About 92 percent of the people are aware of the concept of the health food. The most of feedback were taken from well educated people. These people have sound knowledge of the healthy food items.

4. Health food stores :



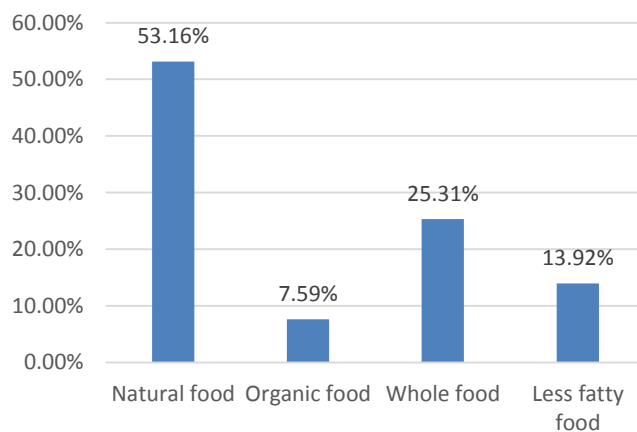
There are enough health food stores in Pune city. According to the responses of the participants, 57 percent people agreed about the existence of the food stores. But still there is more scope for the health stores in the city.

5. Taste of health food:



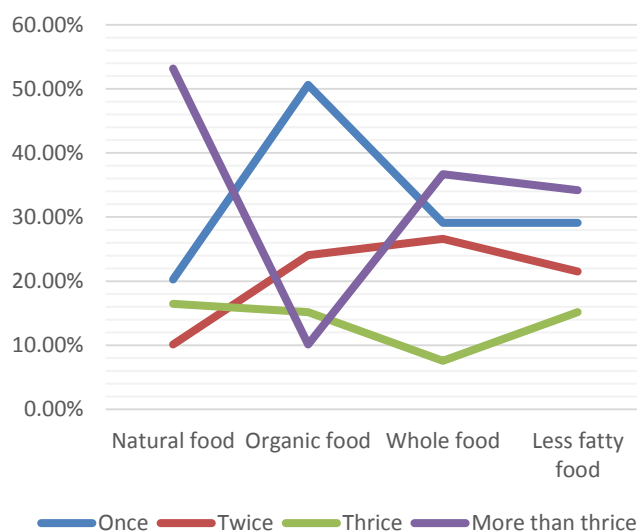
Health food looks same like all other foodstuff. You can't differentiate health food items when it comes to the appearance or texture of the food. But it is slightly different in taste. Most of the people have agreed that health food is tastier than hybrid food stuff.

6. Types of health food:



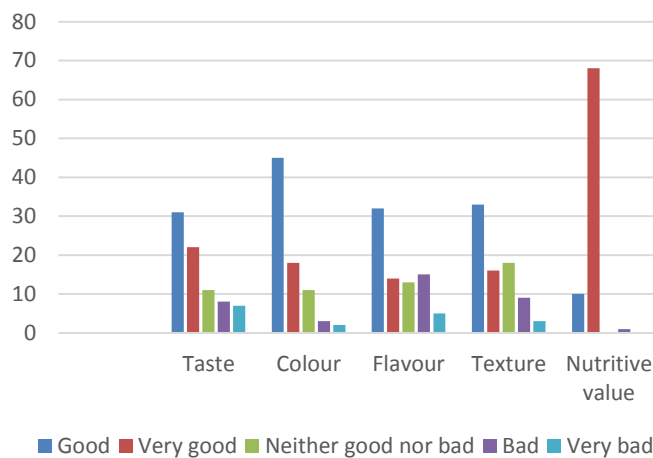
Health food items are categories in four different groups. The question was asked about every type of the health food and more percentage of the people knew about the natural food & very few people know about the organic food.

7. Frequency of buying health food:



When question was asked about the frequency of buying the health food items natural food was bought more than thrice, Organic food once, Whole food twice & less fatty food thrice in a Month. Consumption of natural food is more as compared to other health food.

8. Attributes of health foods:



Question was formulated on different attributes of the health foods like taste, color, flavor, texture and nutritive value. According to the opinion of the respondent health food is very nutritious. Other attributes like color flavor and texture is good of health foods.

7. SUGGESTIONS & RECOMMENDATIONS

- Respondents should be made aware of the concept or types of the health food so that genuine feedback will receive.
- It is suggested to take feedbacks from all cross sections of the society to generalize the popularity of the health food.
- It is suggested to increase awareness about the benefits of consuming health food among the peoples.
- The demand for health food is more so the supply of health food should be increased accordingly to avoid increase cost of food.

8. LIMITATIONS & FUTURE STUDY

- The study is conducted only in Pune city so further study can be carried out in outskirts of Pune/ Maharashtra/other states of India.
- Feedback were collected only from 79 respondents, the number can be increased to generalize for the entire city.
- Classification of the health food is done on the bases of the data available, more extensive study should be carried out for detail classification of health foods.
- Limited numbers of the vendors were visited for the purpose of study

9. CONCLUSION

- Peoples have sound knowledge about the health food which is clear from the fact that 92 percent of the respondents concept of health food.
- More than 50 percent people knew health store in Pune city and number of the stores are enough but still there is more scope for increase in number of stores because demand for the health food is increasing.
- Taste wise health food is better than the regular food because of use of natural resources which fosters natural growth of food & enhances the taste.

- Natural food is more consumed by the people as compared to the organic food, whole food & less fatty food.
- People buy natural food more frequently and other health food once, twice or thrice in a Month.
- Health food is liked by the people because of its health aspect. It is more nutritious as compared to the regular foodstuff.

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Big Five Personality Traits Among Female Under Graduate Students With Specific Reference To Coimbatore City

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Abstract

Personality has been regarded as a practical force in determining the success or failure in life. Personality has been viewed as a source of person's attitude exhibited in the workplace over the years. Personality of an individual starts developing at the early age and is groomed over the education period of individuals. The present education system aims to enable students not just to acquire knowledge but also to become capable, confident and enthusiastic leaders and managers. The aim of the study is to profile the personality of the students across age, education stream and location of residence. The study is descriptive in nature and adopted survey strategy. Data was collected using a questionnaire from the final year under graduate female students in Coimbatore city. The collected data was analyzed using percentage analysis and Analysis of Variance.

1. INTRODUCTION

Personality plays a vital role in the higher education among the students. Personality is a term frequently used by people. It means different things to different people. Personality refers to a unique mode of response to life situations. The term personality has been derived from Latin word 'persona' which means 'to speak through'. Personality influences others through external appearance. The unique way of responding to day-to-day life situations is

the heart of human behavior. Personality embraces all the unique traits and patterns of adjustment of the individuals in his/her relationship with others and his environment. This implies not only the structure of personality but its dynamic qualities as well. Maddi (1990:P.90) defines “Personality is a set of characteristics and tendencies that determine that commonalities and differences in the behavior of people that have continuity in time and that may not be easily understood as the sole result of the social and biological pressures of the moment”.

Personality has been regarded as a practical force in determining the success or failure in life. Personality has been viewed as a source of person's attitude exhibited in the workplace over the years. Personality takes the whole man concept because it affects the various psychological processes. Propositions have been made about the different kinds of personality traits having relevance with the nature of job. The prominent feature of personality traits can be successful in aligning with the particular job requirements. Hence, psychologists have tried to identify the types of personality and traits and thousands of personality traits have been identified that differentiates one person from the other. Since ancient times, humans have sought to explain behavior by categorizing personalities into distinct types. There are various theories for personality namely Trait Theory, Psychodynamic Theory, Behavioral Theory, Cognitive Theory, Social learning Theory. Personality assessments have been developed over the past several centuries to describe the aspects of a person that remain stable throughout a lifetime: the individual's character, pattern of behavior, thoughts, and feelings. Among the personality assessment tools developed by psychologists and social science researchers the big five personality traits proposed by McCrae and Costa, (1990) is popular. Having gained prominence, later recruiters started using personality assessments to sort, classify, and categorize people for the jobs like Managers, Executives, Entrepreneurship, Non- Profit making Professions, Public sector Professions, Scientists, Researchers and Engineers. References to personality assessments have even made their way into books and movies such as Harry Potter, “who was placed into the Gryffindor House at the Hogwarts School by a “sorting hat” that could gauge the temperament of each student”.

Personality of an individual starts developing at the early age and is groomed over the education period of individuals. Schools and colleges conducts program in assessing, shaping and grooming the personality of individuals. The present education system aims to enable students not just to acquire knowledge but also to become capable, confident and enthusiastic leaders and managers. In order to become a skilled, capable leader or manager, a student or an individual should possess an inbuilt personality. Personality brings out the capabilities and strengths of students thus making the student aware of the inner self and thereby becoming more confident to face the outside world. Studies reveal that personality has key influence on individual performance and the job performance. It acts as a major determinant in jobs, where most of the working day is spent interacting with other people what will be done and how it will be done. Each man's personality reveals itself in the way he works with his superior, his subordinates and other people. Everyone has to adjust to a

whole series of changes in the way work is accomplished when job changes. The strengths of an organization are reflected by the personality of those who hold key jobs. Personality types are strong predictors in choosing the students majors and the impact of this choice lasts far beyond students learning and success in college (Porter & Umbach; 2006). Thousands of students and their parents have expressed that their interests are something that they are not directed towards programs and college majors that do not fit their personality. When the personality type fits the students with the chosen specialization, the students can learn and earn better grades.

2. REVIEW OF LITERATURE

It discusses the concepts related to the study through reviews of literature which explains the undergraduate students' personality.

- **Mohsen et al (2009)** studies the relation between the Big five personality traits, self-esteem, and life satisfaction in Iran, with 235 university students at the University of Tehran. The data is analysed using the Correlation and Regression analysis. Among the Big Five traits, extraversion and neuroticism is the strongest predictors of life satisfaction. Self-esteem predicts the life satisfaction over and above the Big Five personality traits. Finding reveals that female students scores significantly higher than male students on life satisfaction. The relation between personality traits and life satisfaction are also consistent with those of previous studies (e.g., DeNeve and Cooper 1998). Bivariate correlation analysis shows that four of the Big Five traits (extraversion, neuroticism, agreeableness and conscientiousness) significantly correlates with life satisfaction. Openness to new experience is not correlated with life satisfaction. Regression analysis shows that extroversion and neuroticism significantly predicts life satisfaction.
- **Zahra et al (2012)** investigates the relationship between the degree, type of mobile usage and personal traits among the students of public and payame-noor universities of Isfahan Province. The sample selected for the study is 300 students comprising of 150 male and female students of three universities by random cluster sampling method and is assessed with a version of (NEO-FFI) inventory scales and self-constructed mobile usage questionnaire. Data is analyzed by applying Pearson product-moment correlation matrix and linear regression. There is an inverse relationship between mobile usage and neuroticism traits. Considering the relationship between the type of mobile usage and personality traits, none of the five personality traits had meaningful relationship with (internet and Bluetooth) usage. There is a positive relationship between using mobile games and neuroticism and had a negative relationship with listening to music via mobile. Extraversion and openness to experiences shows a positive relationship with listening to music. Agreeableness and conscientiousness didn't seem to have any meaningful relationship with listening to music. Among personality traits, neuroticism is the best predictor of the degree and type of mobile usage. Personality traits can better predict the listening to music in comparison to other mobile usages.

- **Elizabeth et al (2001)** study compares the Computer related stress levels in three business student populations of 239 students comprising of juniors, seniors (MIS majors) and graduate MBA students. Standard analysis of variance shows that MIS students experienced a significantly higher number of stressors than the other two groups and a greater average severity of stress than the pre- majors. Human-computer interaction is suspected to be more stressful for MIS students than other business students because their use of computers is greater and their grades are more heavily weighted towards computer work. This study considers the various personality types/learning styles of the students and investigates how they might be accommodated to minimize anxiety. The Myers-Briggs Type Indicator (MBTI) test and a computer assignment preference test are administered. This would seem to be especially important in student populations where computer stress levels are high. While individualized environments and assignment criteria are not always pragmatic, it is possible to provide a variety of assignment choices and to focus on those variables that accommodate the learning style.
- **Clark et al (2007)** examines the relationship between the Big Five Personality Dimensions and Attitudes towards Telecommuting. The basic logic of fit theory is to focus on the fit between an individual's personality and the type of work arrangement. Multi-facet questionnaire is used for measuring the attitude towards telecommuting using a sample of students at a large south eastern University. Factor analysis is used to identify a four factor solution, establishing internal consistency. Additional analysis is made to finalise a 38-item version of the telecommuting attitudes scale with excellent internal consistency ($H=.91$) and four meaningful factors each had good to very good internal consistency (H ranging from .81 to .85). The results show that emotional stability has a significant negative relationship with telecommuting attitudes. Agreeableness is found to have a positive relationship with telecommuting attitudes. Conscientiousness has a positive relationship with telecommuting Work Preferences. Lack of relationship between either extraversion or openness and attitude towards telecommuting. It serves as the dynamics of telecommuting attitude formation and various telecommuting outcomes. It facilitates in developing a comprehensive, multi- dimensional scale with excellent reliability for measuring telecommuting.
- **John W. Lounsbury et al (2009)** enumerates the Personality Characteristics of Business Majors as defined by the Big Five and Narrow Personality Traits, using data from 347 undergraduate business majors and 2,252 non business majors at a large South eastern university and investigates whether the 2 groups differs in Big Five model of personality (B.De Raad, 2000; agreeableness, conscientiousness, emotional stability, extraversion, openness) and 4 narrow personality traits. Business majors scored higher for conscientiousness, emotional stability, extraversion, assertiveness, and tough-mindedness, and scored lower on agreeableness and openness. All of the traits except for agreeableness and tough-mindedness correlate significantly and positively with life satisfaction. The study is useful from a practical standpoint in terms of advising college students considering a major in business and business majors planning their careers.

- **Iftikhar Ahmad (2010)** identifies the Performance of Students and Community in Pakistan using 452 undergraduate students in Pakistan. Item-analysis reveals that the response pattern of the students differentiates across the five response choices for 44 of the 60 items. The mean scores of the respondents are close to a theoretical average of 35 for each scale. Girls score significantly higher than boys on Neuroticism and Conscientiousness scales. The alpha index for the Neuroticism and Conscientiousness scales is in the 70s for Extraversion scale in the 50s and for Openness and Agreeableness scales in the 40s. The inventory is thereafter administered to a community sample of 320 (male 139, female, 181) gains 2-3 points in mean scores over the student sample on Neuroticism and Conscientiousness scales. The Big Five (Urdu version) evaluates in the context of Pakistan both on students as well as on community sample, the two populations where it can be potentially used. The scores of boys and girls are the same on this inventory except on conscientiousness and neuroticism scales where girls scores significantly higher than boys. Moreover, consciousness is relevant to achievement in the college.
- **Deborah Prentice (1999)** argues that student satisfaction is an important educational outcome. The study concerns with accounting education. The study groups the participants as juniors, seniors, master's students, and new professionals. Undergraduate and master's accounting students and newly hired CPA firm accounting professionals are its subjects. There are three research questions: The levels of program and university satisfaction of the participants; the participants' composite personality profile; and third, the relationship between satisfaction and personality for the participants. Two instruments used are modified College Student Satisfaction Questionnaire for student satisfaction, and the BFI-44, a Big Five trait model instrument, for personality. Mean satisfaction score is compared with class level and by institution. A correlation analysis reveals relationships between satisfaction and personality. Regression analysis discloses that personality subscales contributes most as predictors of satisfaction. The new accounting professionals have higher mean satisfaction scores than all other groups in the study. The personality profile reveals the accounting students as low on Neuroticism, average on Extraversion and Openness, and moderately high on Agreeableness and Conscientiousness. With satisfaction as the dependent variable and personality as the independent variable there is an R^2 of .107, indicating 11% of the variance. All groups have basically the same personality profile. The study shows that accounting students are higher on Extraversion, lower on openness; higher on Conscientiousness and reveals their thoroughness in completing their tasks.
- **Jeff Brice (2002)** suggests that entrepreneurial intentions are formed from an integration of personality dimensions (traits), mental ability, general and entrepreneurial self-efficacy, and occupational preference for an entrepreneurial career. A comprehensive theoretical model is developed based on the incorporation of variables from three disparate research perspectives. The sample of 833 university student respondents is taken for the study composed of undergraduate graduating business students, MBA

students, and veterinary students who are in the process of making career-related decisions. The majority of data are collected utilizing an Internet web-based self-report methodology (on-line survey). An empirical investigation is performed on a single path of the theoretical model, which evaluated with Five-factor model of personality. Data is analysed using the factor analysis and multi regression analysis Dimensions and preference for an entrepreneurial career based on the rewards of independence, profit, and a satisfying way of life for the formation of entrepreneurial intentions. Preference for an entrepreneurial career based on the expectation of profits is assessed as a moderator of the relationship between entrepreneurial career preference based on the reward of a satisfying way of life and entrepreneurial intentions. The result indicates that high Openness and low Agreeableness are the only personality dimensions that are directly related to the formation of entrepreneurial intentions. The rewards of independence and profits are affirmed and have a significant direct effect on entrepreneurial intentions. Openness demonstrates a mediated effect on entrepreneurial intentions through preference for the reward of independence while Conscientiousness exhibited a mediated effect on entrepreneurial intentions through both of the intrinsic entrepreneurial career preference constructs independence and a satisfying lifestyle. It suggests that people who are attracted to independence, profit, and challenges are good candidates to form the intentions to start a business. Therefore, any entrepreneurial training that they receive should include in-depth analyses about which rewards may reasonably be attained and in what timeframes for particular types of businesses.

- **Anitsal et al (2010)** analysed the impact of on-line and on-ground course characteristics by Undergraduate Student Personality Traits. Students from 21 courses are approached for collecting the data. The survey is completed with 355 undergraduate students. The data is divided among the students of on-line courses (n= 65), students of on-ground courses (n=37), and students of on-ground courses with online elements. Factor loadings for need for cognition, self-sufficiency, and the five factor model of personality (extraversion, neuroticism, open to experience, agreeableness and conscientiousness) indicate that measurement items measures and therefore provide evidence about the existence of validity. Cronbach's alpha values for each measure range between 0.531 and 0.790, indicating sufficient reliability. The mean value for each objective for the total sample are considerably high, (real life problem solving= 4.12, team work= 4.15, creativity=3.85, and critical thinking= 3.96) indicating successful QEP implementation. Students in on-ground courses with on-line elements have a higher mean on teamwork than those in fully on-line courses, though this difference is statistically insignificant. The analysis is to look at correlates of personality traits, types of courses, and four objectives of QEP. Among students of fully on-line courses, agreeableness is the On-Ground Courses with On-Line Elements. With the increasing popularity of distance education, a growing body of research is emerging which investigates personality characteristics, the types of students that are successful online and the differences between on-line students

and traditional students. Understanding these personality traits will help educators fine-tune their course designs and delivery methods based on their students' needs.

- **Hsiang-Yung Feng (2012)** identifies the relationship of Taiwanese university students' personality traits, motivations on overseas internship and their achievements. Taiwan Ministry of Education (MOE) provides university students overseas internships from 2008. The sample of 131 students who have participated overseas internship is collected. There are 29.0% male and 71.0% female. The questionnaire includes 4 parts: personal information, overseas internship sites, personality traits, motivations on overseas internships and achievement of overseas internship. The personality traits have 12 questions, includes five characteristics: openness, conscientiousness, extraversion, agreeableness and neuroticism. The motivations on overseas internships have 14 questions, divided into five factors: relaxation, looking for excitement, social expanding, visiting and learning, novelty and self-realization. Achievement of overseas internship covered by intrinsic, extrinsic evaluation. Statistical analysis is conducted using SPSS software. Descriptive statistics are used to understand the distribution of students' demographic data. Confirmatory factor analysis (CFA) is adopted to know the factors of personality traits and motivations of overseas internship. Canonical analysis is to analyse the relationship between personality traits and motivations of overseas internship. Overseas workers' nature of personality traits were extraversion, conscientiousness and agreeableness. They wanted to get to know more about other countries culture, scenery, and customs, etc. Besides, travel youth workers are easy to get along with people. The qualities such as trust and friendliness make them collaborate with other young people more easily. Overseas internships for students can be rewarding experiences that dramatically change the perspectives of globalization and visions. The results shows that students with the trait of motivation looking for excitement also possess the personality traits of agreeableness, openness to experience. While the students with the trait of self-satisfaction own the personality traits of extraversion, agreeableness, and openness to experience. Integrated achievement of overseas internship was in relation to personality traits, although intrinsic achievement had relations with motivation.
- **Aslam et al (2001)** investigated the relationship between student's personality traits such as Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness with the academic dishonest behaviours of students. A well-structured questionnaire is used to collect the data from 932 respondents studying at graduate and undergraduate levels in different Pakistani universities. The cross tabulation is used among, Academic Program, Age Group and Major compares with Gender of the respondents. Correlations analysis has been used to investigate the relationship of personality traits with frequency of students' frequency of involvement in academic dishonesty. Mean and standard deviation columns show that overall students have been found high in all personality traits. The need is to have a careful insight by the academicians and policy makers on the ethical and moral values of students at the undergraduate level at a university. This puts stress on the requirement to impact the course of Ethics in the undergraduate curriculum, especially

for non-business students. The results provide a strong implication for academicians to develop the moralities and ethics in students so that institutions may provide ethically cultivated professionals to the business community.

3. OBJECTIVES OF THE STUDY

To profile the personality of the students across age, education stream and location of residence.

4. METHODOLOGY

The research purpose and research questions revealed that this study is descriptive in nature and the study adopted survey strategy. Data was collected using a standard questionnaire. Each response was measured using a three-point Likert scales, ranging from 5- completely agree to 1- completely disagree. The sample size is 151 comprising of Undergraduate students from Arts and Science and Management (BBM and Allied courses) disciplines. Data was collected during the period August 2015 to February 2016. The study used percentage analysis to profile the respondents, ANOVA to identify differences in the levels of personality across respondents of varied demographic profiles. The primary data used by the study were directly obtained from the questionnaire. The Personality questionnaire consists of 20 items, four from each of the five personality variables, developed based on a review of the IPIP five factor personality (Big five Personality) inventory (Buchanan, 2001). They are, namely, conscientiousness, openness, extraversion, agreeableness and neuroticism. The average of the items in each factor is computed and is used for analysis.

5. ANALYSIS AND DISCUSSION

5.1 Profile of the Respondents

6% of the respondents are in the age group of 23 & 24 years. 45% of the respondents are in the age group of 21 years; 34.4% of the respondents are under graduates in the Arts and Science stream and 27.8% of the respondents are under the Management (BBM) stream. 19.2% of the respondents are under graduates in the Arts and Science stream and 18.5% of the respondents are under the Management (MBA) stream. 31.8% of the respondents are residing in the rural areas, 45% are from urban areas and 23.2% are from semi-urban areas. 50.3% of the respondents scored 81-90% of marks. 6% of the respondents scored 50-60% of marks. This portrays the diverse profile of the respondents which is essential for the study, since the study focuses in enumerating the role of personality among Females graduate students.

5.2 Descriptive Statistics

The Descriptive procedure displays univariate summary statistics for the factors and calculates standardized values (z scores).

Table 1: Descriptive Statistics

Factors	N	Mean	Std. Deviation
AGR	151	2.8924	0.63673
EXT	151	3.2649	0.81865

NEU	151	3.2864	0.70321
CON	151	3.1838	0.64659
OPEN	151	3.5762	0.72399

The mean value for the variable openness is higher (3.5762) which implies that the respondents are open to new and non-traditional ideas and are curious about the world around them. The mean value for the variable Neuroticism is (3.2864) which implies that the respondents have typically experiencing negative effects includes sadness, anger, embarrassment and guilt. The standard deviation is high for Extroversion (0.81865) among the three indicating that the person's sociability, they prefer to be in a large group and are talkative.

5.3 Analysis of Variance

Analysis of variance was carried out to find whether respondents of varied demographic profile differed in their perception towards Big Five Personality Inventory.

Table 2: ANOVA across respondents of varied Age

		20 yrs	21 yrs	22yrs	23 yrs	24 yrs	25 yrs
Agreeableness	N	12	68	30	9	9	23
	Mean	2.8750	2.7169	3.2167	2.2500	4.0000	2.8152
	F	14.364					
	Sig.	.000					
Extroversion	N	12	68	30	9	9	23
	Mean	3.9375	3.4632	2.8917	2.7500	2.5000	3.3152
	F	7.199					
	Sig.	.000					
Neuroticism	N	12	68	30	9	9	23
	Mean	3.2500	3.4632	3.2333	3.7500	1.5000	3.3696
	F	23.295					
	Sig.	.000					
Conscientiousness	N	12	68	30	9	9	23
	Mean	2.5625	3.1838	3.2500	3.5000	2.7500	3.4674
	F	4.990					
	Sig.	.000					
Openness	N	12	68	30	9	9	23
	Mean	3.1875	3.6544	3.9833	2.5000	4.0000	3.2717
	F	10.827					
	Sig.	.000					

Table 2 reveals that the mean value of students for the variable Agreeableness is higher among 24 yrs category as they are general altruistic tendency, being sympathetic and eager to help others. The mean value for the variable Extroversion is higher among 20yrs category, because the students entering the higher education are sociable, prefer large group,

assertive and talkative. The mean value for the variable Neuroticism is higher among 23yrs category, because the students in the middle of the education typically experiences, negative effects, including sadness, anger, embarrassment, and guilt. The mean value for the variable Conscientiousness is higher among 23yrs category, because the student's ability, or inability, desires, being strong-willed, determined, and high achieving. The mean value for the variable Openness is higher among 24yrs category, because the student's belonging to the Final years are more open to new and non-traditional ideas and are curious about the world around them. There is significant difference in the perception of the Age of the students for the variables Agreeableness ($F=23.295$; $p<0.000$), Extroversion ($F=7.199$; $p<0.000$) and Neuroticism ($F=23.295$; $p<0.000$), Conscientiousness ($F=4.990$; $p<0.000$), Openness ($F=10.827$; $p<0.000$).

Table 3: ANOVA across respondents of varied under graduate discipline

		N	Mean	F	Sig.
Agreeableness	Arts and Science	52	3.0144	31.715	.000
	Management	42	2.4464		
Extroversion	Arts and Science	52	3.4038	22.229	.000
	Management	42	2.8274		
Neuroticism	Arts and Science	52	3.4808	9.125	.003
	Management	42	3.1786		
Conscientiousness	Arts and Science	52	3.4038	6.928	.010
	Management	42	3.1071		
Openness	Arts and Science	52	3.8798	36.121	.000
	Management	42	3.1071		

Table 3 reveals that for all the five factors the mean value of students from Arts and Science Discipline is higher students from Management Discipline. This could be because the students from the Arts and Science discipline are more focused towards exploring new things and they are learning the courses practical than the management students. There is significant difference in the perception of the undergraduate students of Arts and Science Discipline and Management Discipline for the variable Agreeableness ($F=31.715$; $p<0.000$), Extroversion ($F=22.229$; $p<0.000$), Neuroticism ($F=9.125$; $p<0.003$), Conscientiousness ($F=6.928$; $p<0.010$), Openness ($F=36.121$; $p<0.000$).

Table 4: ANOVA across respondents of varied location of residence

		N	Mean	F	Sig.
Agreeableness	Rural	48	2.8333	31.322	.000
	Urban	68	2.6213		
	Semiurban	35	3.5000		
Extroversion	Rural	48	3.5417	5.844	.004
	Urban	68	3.0368		

	Semiurban	35	3.3286		
Neuroticism	Rural	48	3.6406	10.123	.000
	Urban	68	3.0993		
	Semiurban	35	3.1643		
Conscientiousness	Rural	48	3.5625	22.527	.000
	Urban	68	2.8566		
	Semiurban	35	3.3000		
Openness	Rural	48	3.9167	22.093	.000
	Urban	68	3.1949		
	Semiurban	35	3.8500		

There is significant difference in the perception of respondents of residing in Urban, Rural and Semi-urban areas regarding the variables Agreeableness ($F=31.322$; $p<0.000$), Extroversion ($F=5.844$; $p<0.004$), Neuroticism ($F=10.123$; $p<0.000$), Conscientiousness ($F=22.527$; $p<0.000$), Openness ($F=22.093$; $p<0.000$). Since there is significant difference in the perception post hoc analysis was carried out to find students residing from which locality differed in their perception from the others.

Table 5: Posthoc analysis for respondents of varied location of residence

Residence	N	Agreeableness		Extroversion		Neuroticism		Conscientiousness			Openness	
		Subset for alpha = 0.05		Subset for alpha = 0.05		Subset for alpha = 0.05		Subset for alpha = 0.05			Subset for alpha = 0.05	
		1	2	1	2	1	2	1	2	3	1	2
Urban	48	2.6213		3.0368		3.0993		2.8566			3.1949	
Semi-urban	68	2.8333		3.3286	3.3286	3.1643			3.3000			3.8500
Rural	35		3.5000		3.5417		3.6406			3.5625		3.9167

Post hoc analysis reveals that students residing in rural areas have scored a higher mean value for Agreeableness, Extroversion, Neuroticism and Openness fall under one subset, Conscientiousness which have higher score falls under the third subset, whereas students from Urban and Semi-urban area fall in the other subset. The reason for this is due to physical reasons, there are certain limits to them as imparted by society, and the regulations are strongly implemented in rural environment, crushing the desires and aspirations unnecessarily. While sympathy and co-operation is shown in urban families towards their achievements and hopes this smoothens and fulfils the desires. The overall attitude of the family and society makes her guilty feeling and suppressive can't go for self-expression and self-realization.

6. CONCLUSION

Personality variable plays an important role among the students. Personality of the students while planning any kind of educational intervention program in colleges and schools is

needed. Service of the psychologists, special educators and social workers must be availed by college authorities to render a professional help to the academic low achievers. The efficacy of the counselling and awareness program in helping the teachers, parents and the students to handle the issue related to low achievement. Various factors influencing the personality includes: Heredity factors, Physical, Social, Family, Cultural and School environment, Psychological Factors. The colleges expect not only to give instruction, but to develop the individual whole personality-developing and nurturing an individual's intellect, and character and value system. Hence, the study reveals that the Imbalance in personality is caused due to suppressed desires and instincts as society has imposed certain restrictions upon her even before she enters adolescence. A teacher should be a blend of both professional commitment and professional competency which will bring a sense of pride, achievement and real joy in teaching in return yielding quality in education consequently to the development of the wholesome personality of the students.

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A Study On Information And Communication Technology Awareness Among B.Ed. Trainees In Colleges Of Education In Pudukkottai District

Paper ID	IJIFR/V3/ E12/ 004	Page No.	4423-4432	Subject Area	Education
Key Words	Information And Communication Technology, 900 B.Ed Trainees, Rural Boys And Rural Girls, Tamil Nadu Teachers Education, Education In Pudukkottai District				

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Abstract

Indian Education Commission holds (1964-1966), "Education serves as a powerful instrument of social, economic & cultural transformation necessary for the realization of the national goals". Nowadays ICT is vastly used in the field of education. ICT creates the teachers' teaching more effectively and enhances students' learning interest and their potentials and abilities. Teachers without the knowledge and skills of ICT cannot present and deliver the subject matter to switch on the students in a clear manner. It is more helpful to the teachers and the students. And also ICT is one of the sources of learning unavoidably in the present situation. As per the Government Vision of Inclusion of ICT facilities in school it is teacher's responsibility to be well versed in ICT knowledge. To be well versed in ICT the teacher training institute should provide adequate ICT facilities and computer education to the future teachers. Our objectives of this study were known and understood in thorough ICT awareness of B.Ed. trainees in colleges of education in Pudukkottai District. By this term ICT Awareness the investigator means how B.Ed. trainees in colleges of education see and observe the value system with the help of ICT. It implies that values are not simply and evenly distributed but are personalized by judging things, qualities, events, or actions from a personal point of view. Thus our research will suggest the expressive exploration, through the analysis of ICT awareness of B.Ed. trainees in colleges of education in Pudukkottai district. Finally, the author has calculated the average of B.Ed. trainees' awareness on ICT with regard to B.Ed. trainees' locality and gender through ICT Awareness scale. This will help to provide more accuracy to the results. In the present study, one government B.Ed. college and fourteen self-finance B.Ed. colleges were recognized by the Directorate Of Higher Education and affiliated the Tamil Nadu Teachers Education University under taken by the

state government of Tamil Nadu have been chosen, The sample of the present study consists of 900 B.Ed. trainees. Among them 450 are male and 450 are female. The normative survey method is followed to collect the data. The data was quantified and analysed in the term of t-test and percentage.

1. INTRODUCTION

Indian Education Commission holds (1964-1966), “Education serves as a powerful instrument of social, economic & cultural transformation necessary for the realization of the national goals”. Information and Communication Technology is defined as the use of hardware and software for efficient management of information. i.e. storage, retrieval, processing, communication, diffusion and sharing of information for social, economic and cultural upliftment. The UNESCO defines information and communication technology (ICT) as “scientific, technological and engineering disciplines and the management technique used in information handling and processing, their application, computers and their interaction with men and machines, and associated with social, economic and cultural matter”.

Nowadays ICT is vastly used in the field of education. ICT creates the teachers’ teaching more effectively and enhances students’ learning interest and their potentials and abilities. Teachers without the knowledge and skills of ICT cannot present and deliver the subject matter to switch on the students in a clear manner. It is more helpful to the teachers and the students. And also ICT is one of the sources of learning unavoidably in the present situation.

2. NEED AND IMPORTANCE OF THE STUDY

Inclusion of ICT in the existing B.Ed. curriculum is very important and its effective integration into the main stream is absolutely essential. Teachers are being challenged to integrate ICT’s in to the curriculum and to facilitate new forms of teaching and learning. It is very difficult for them to accept this responsibility before mastering basic computer literacy skills and demonstrating a high degree of confidence in the general use of ICTs. As per the government vision of inclusion of ICT facilities in school it is teacher’s responsibility to be well versed in ICT knowledge. To be well versed in ICT the teacher training institute should provide adequate ICT facilities and computer education to the future teacher. In the content, there is a need to study some aspects of ICT in the colleges of education. The present investigation fulfills the research gap of the study.

3. OBJECTIVES OF THE STUDY

The objectives of a research project are to summarize what is to be achieved by the study. These objectives should be closely related to the research problem.

(I) General Objectives Of The Study

- a. To know the ICT awareness of B.Ed. trainees in colleges of education in Pudukkottai district.

- b. To understand the ICT awareness of B.Ed trainees in colleges of education in Pudukkottai district.

(II) Specific Objectives Of The Study

- a. To identify the knowledge among the B.Ed. trainees in college of education in different areas of ICT aspects.
- b. To find out the awareness on ICT of B.Ed. trainees in college of education in Pudukkottai district.
- c. To find out the difference between the rural boys and rural girls B.Ed. trainees in college of education with regard to awareness on ICT.
- d. To find out the difference between the rural boys and urban boys B.Ed. trainees in college of education with regard to awareness on ICT.
- e. To find out the difference between the rural boys and urban girls B.Ed. trainees in college of education with regard to awareness on ICT.
- f. To find out the difference between the rural girls boys and urban boys B.Ed. trainees in college of education with regard to awareness on ICT.
- g. To find out the difference between the rural girls and urban girls B.Ed. trainees in college of education with regard to awareness on ICT.
- h. To find out the difference between the urban boys and urban girls B.Ed. trainees in college of education with regard to awareness on ICT.

4. STATEMENT OF THE PROBLEM

ICT awareness involves knowing about the existence and importance of the ICT tools and their application. Potential ICT users should be enriched with a number of ICT awareness programmes in order to increase the usage of ICT facilities. This can be achieved through promotional programmes which include electronic media resources such as radio, TV and website; print media such as newspapers, magazines, newsletters and notice boards and organization of workshops, seminars, conferences and public lectures. ICT awareness can also be created through the inclusion of ICT courses into B.Ed. trainees in colleges of education in Pudukkottai district.

5. OPERATIONAL DEFINITIONS

i. Study

By the term 'study' the investigator means an attempt to gain knowledge from relevant materials.

ii. ICT

Information and communication technology (ICT) as "scientific, technological and engineering disciplines and the management technique used in information handling and processing, their application, computers and their interaction with men and machines, and associated with social, economic and cultural matter.

iii. ICT Awareness

By this term the investigator means how B.Ed. trainees in colleges of education see and observe the value system of help of ICT. It implies that values are not simply and evenly distributed but are personalized by judging things, qualities, events, or actions from a personal point of view.

iv. **B.Ed. Trainees**

The trainees who are pursuing bachelor degree course of study in education in the colleges of education are designated as “B.Ed. college students”.

v. **Pudukkottai District**

Pudukkottai district is one of the revenue district of Tamil Nadu State.

5. HYPOTHESES OF THE STUDY

The following hypotheses have been formulated on the basis of the objectives of the present study.

- i.) The B.Ed trainees in college of education have no awareness about ICT
- ii.) There is no significant difference between the rural boys and rural girls B.Ed trainees in college of education with regard to awareness on ICT.
- iii.) There is no significant difference between the rural boys and urban boys B.Ed trainees in college of education with regard to awareness on ICT.
- iv.) There is no significant difference between the rural boys and urban girls B.Ed trainees in college of education with regard to awareness on ICT.
- v.) There is no significant difference between the rural girls and urban boys B.Ed trainees in college of education with regard to awareness on ICT.
- vi.) There is no significant difference between the rural girls and urban girls B.Ed trainees in college of education with regard to awareness on ICT.
- vii.) There is no significant difference between the urban boys and urban girls B.Ed trainees in college of education with regard to awareness on ICT.

6. VARIABLES OF THE STUDY

a. **Primary variable**

Awareness on ICT

b. **Secondary variable**

B.Ed. trainees in college of education

c. **Moderate variables**

- i.) Locality of B.Ed. trainees like rural and urban areas
- ii.) The gender of the trainees are boys and girls

7. SAMPLING OF THE STUDY

The sample of the present study consists of 900 B.Ed. trainees. Among them 450 are male and 450 are female. Sample is a small proportion of a population selected for observation and analysis. In this study the sample consists of 900 B.Ed. trainees in colleges of education in Pudukkottai district”. It is shown in the table below.

Table 1: B.Ed. College-Wise Distribution Of The Sample

Sl. No	Name of the B.Ed college	Number of Students
1.	Sri Manickam College of Education-Sivapuram.	50
2.	J.J.College of Education- Sivapuram	75
3.	Auxilium College of Education-Ragunathapuram	75
4.	B.T.K B.Ed College of Education-Viralimalai	50
5.	J.K College of Education-Kunnakurambi	50
6.	Mahatma College of Education, Ariyur	75
7.	S.V.S College of Education- Pudukkottai.	50
8.	Sri Bharathi College of Education- Kaikurichi.	50
9.	Government College of Education- Pudukkottai.	100
10.	Sri Bharathi Vidhyalaya College of Education- Thirugokarnam	75
11.	Keerai Thamil Selvan College of Education for Women - KTS Nagar.	50
12.	Naina Mohamed College of Education- Rajendrapuram	50
13.	St.Xaviers College of Education-Venkatakulam	50
14.	Sudharsan College of Education-Perumanadu	50
15.	Sasthaa College of Education-Kilanilaikottai	50
	Total Sample	900

i.) Tool Used For The Study

For the present study, the investigator studied some of the available tools and found that the ICT Awareness scale developed by Dr. Prabhavati Devi, Y. (2004) for his doctoral study, is suitable for the present investigation. The investigator in consultation with the guide modified the tool to suit his study and prepared the ICT Awareness scale.

ii.) Data Collection

The normative survey method is followed to collect the data. These data are collected from Government and Self- Finance B.Ed Colleges only and not from the Government Aided B.Ed College in Pudukkottai District. The researcher could select the face to face survey method (Direct Survey) in this study because he wanted to avoid the non-statistical errors.

iii.) Statistical Techniques

The data was quantified and analysed in the term of t-test and percentage.

8. DELIMITATION OF THE STUDY

- i.) The study is explained with the following delimitations.
- ii.) The study was limited to B.Ed. trainees in college of education only.
- iii.) The study was restricted to a sample chosen from Pudukkottai district only.
- iv.) The study was restricted only to Government and self-finance B.Ed. trainees in college of education.
- v.) Sample size was restricted to 900 B.Ed. trainees only.
- vi.) Data were collected by the researcher through survey method only

- vii.) Direct survey adapted.
- viii.) Questionnaire on ICT awareness was used to collect the data.
- ix.) 't' test and Percentage were adapted in this research.

9. ANALYSIS AND INTERPRETATION OF THE STUDY

I. Awareness Of ICT Among B.Ed. Trainees

In order to find out the level of Awareness of ICT among B.Ed. trainees in colleges of education percentage was calculated.

Table 2: Awareness Of ICT Among B.Ed. Trainees

No. of Respondents	Level of Awareness	Percentage of Awareness
90	Low	10%
810	High	90%

The calculated percentage of the respondents was 10% at low level and 90% at high level. Hence the formulated hypothesis ICT among B.Ed. trainees possess awareness on ICT is accepted.

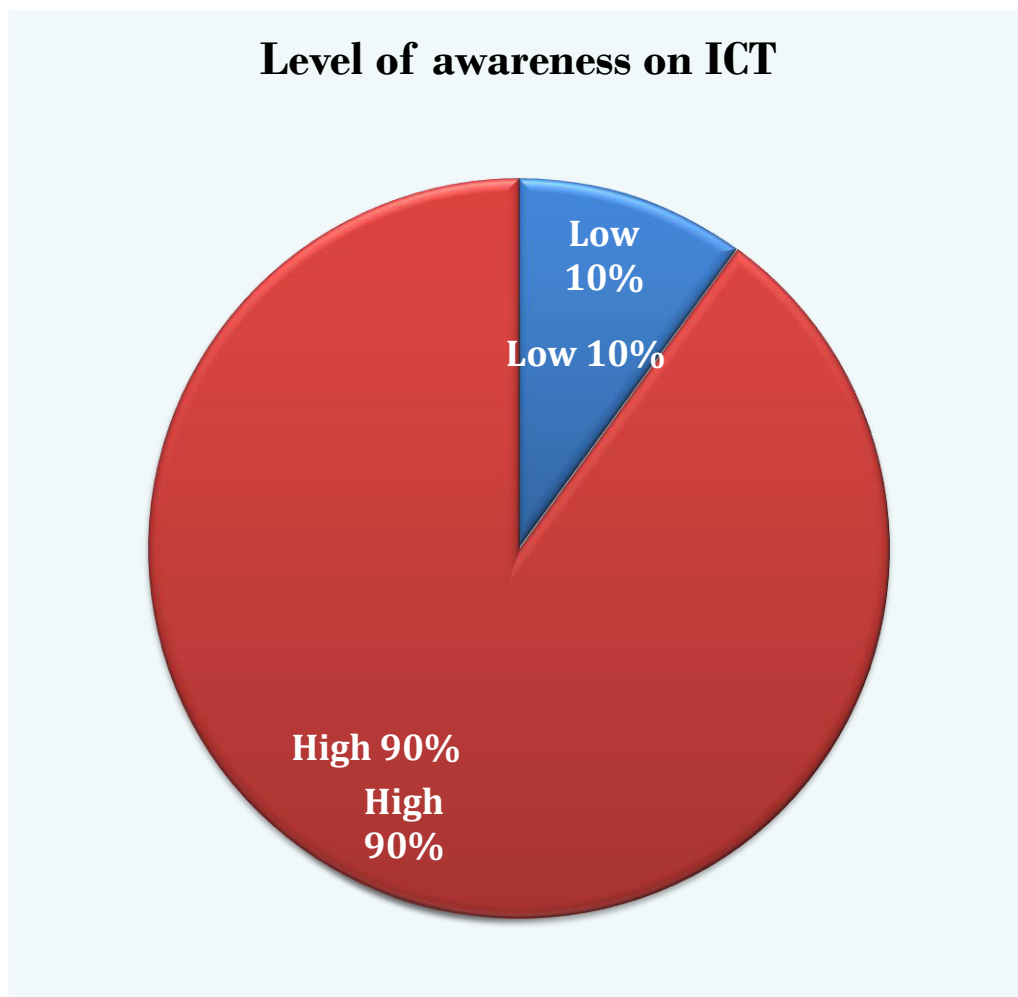


Figure 1: Graphical representation of level of awareness on ICT

II. Awareness On ICT For Urban Boys, Rural Boys, Rural Girls And Urban Girls B.Ed Trainees

Table 2: Awareness On ICT

Sl. No.	Variable	No.	Mean	SE	Between	t-Value	Significance at 0.05
1	Rural Boys	225	68.72	12.538	1&2	0.2776	No Significance
2	Rural Girls	225	69.30	12.935	1&3	3.7520	Significance
3	Urban Boys	225	76.17	13.617	1&4	4.1410	Significance
4	Urban Girls	225	77.37	12.829	2&3	3.1068	Significance
					2&4	3.5020	Significance
					3&4	0.5427	No Significance

Significance at 0.05 Levels

- The calculated 't' value between the rural boys and rural girls is **0.2776** which is less than the theoretical 't' value at 0.05 level (1.96). So there is no significant difference between the rural boys and rural girls B.Ed. trainees with regard to awareness on ICT is accepted that means rural boys and rural girls B.Ed. trainees with regard to awareness on ICT is more or less same.
- The calculated 't' value between the rural boys and urban boys is **3.7520** which is greater than the theoretical 't' value at 0.05 level (1.96). So there is no significant difference between the rural boys and urban boys B.Ed. trainees with regard to awareness on ICT is rejected that means urban boys is more awareness on ICT than rural boys.
- The calculated 't' value between the rural boys and urban girls is **4.1410** which is greater than the theoretical 't' value at 0.05 level (1.96). So there is no significant difference between the rural boys and urban girls B.Ed. trainees with regard to awareness on ICT is rejected that means urban girls is more awareness on ICT than rural boys.
- The calculated 't' value between the rural girls and urban boys is **3.1068** which is greater than the theoretical 't' value at 0.05 level (1.96). So there is no significant difference between the rural girls and urban boys B.Ed. trainees with regard to awareness on ICT is rejected that means urban boys is more awareness on ICT than rural girls.
- The calculated 't' value between the rural girls and urban girls is **3.5020** which is greater than the theoretical 't' value at 0.05 level (1.96). So there is no significant difference between the rural girls and urban girls B.Ed. trainees with regard to awareness on ICT is rejected that means urban girls is more awareness on ICT than rural girls.
- The calculated 't' value between the urban boys and urban girls is **0.5427** which is less than the theoretical 't' value at 0.05 level (1.96). So there is no significant difference between the urban boys and urban girls B.Ed. trainees with regard to awareness on ICT is accepted that means urban boys and urban girls B.Ed. trainees with regard to awareness on ICT is more or less same.

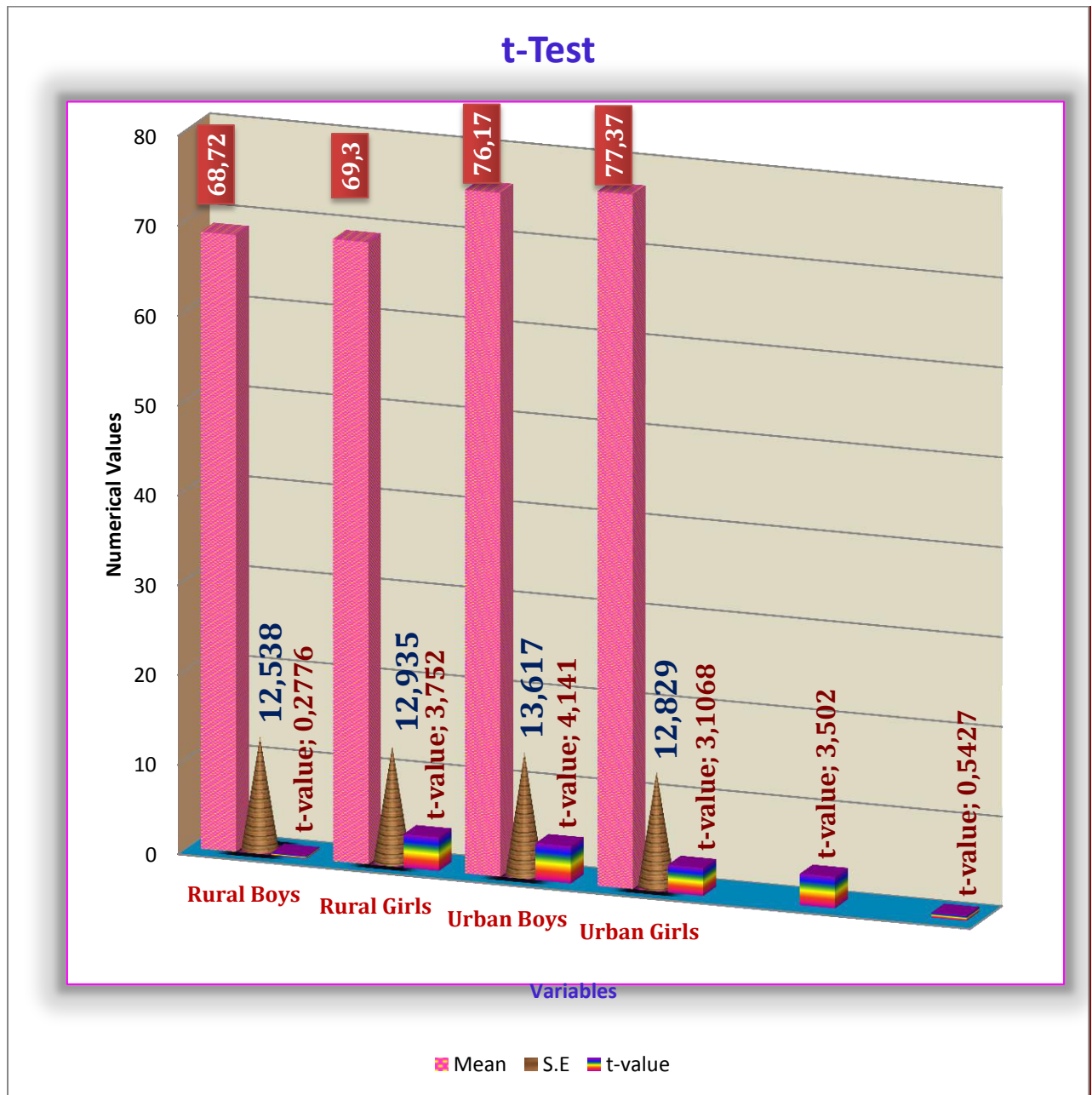


Figure 2: Graphical Representation for Urban Boys, Rural Boys, Rural Girls and Urban Girls B.Ed Trainees

10. MAJOR FINDING OF THE STUDY

Our major findings reveal

- i. 90% of the B.Ed trainees have awareness on ICT.
- ii. There is no significant difference between the rural boys and rural girls B.Ed trainees with regard to awareness on ICT that means rural boys and rural girls B.Ed trainees with regard to awareness on ICT is more or less same.

- iii. There is no significant difference between the urban boys and urban girls B.Ed trainees with regard to awareness on ICT that means urban boys and urban girls B.Ed trainees with regard to awareness on ICT is more or less same.
- iv. There is a significant difference between the rural boys and urban boys B.Ed trainees with regard to awareness on ICT that means urban boys is more awareness on ICT than rural boys.
- v. There is a significant difference between the rural boys and urban girls B.Ed trainees with regard to awareness on ICT that means urban girls is more awareness on ICT than rural boys.
- vi. There is a significant difference between the rural girls and urban boys B.Ed trainees with regard to awareness on ICT that means urban boys is more awareness on ICT than rural girls.
- vii. There is a significant difference between the rural girls and urban girls B.Ed trainees with regard to awareness on ICT that means urban girls is more awareness on ICT than rural girls.

11. IMPLICATIONS OF THE STUDY

- i. To develop the steps for the creation of awareness on ICT should be taken by GOVT, NGO and the PUBLIC raises and maintains.
- ii. All institutions must arrange seminars, workshops and panel discussion to create awareness on ICT.
- iii. All the states motivate self-employment awareness to ICT in all levels.
- iv. To develop awareness on ICT knowledge, attitude and skills among the B.Ed. trainees.
- v. The institution must arrange exhibition in which the study of awareness on ICT and its problem should be given importance.
- vi. B.Ed. trainees should read lot of books about awareness on ICT. Enough books on awareness on ICT should be available in the public library.
- vii. The institution must incorporate ICT for teaching in different situation.
- viii. The institution must incorporate ICT for management technique in different situation.
- ix. The student teachers can visit any university which established the ICT laboratory for education purpose only such as educational studio, e-content development centre and etc.
- x. Student teachers are motivated to prepare and present the subject matter by using ICT.

12. CONCLUSION

The researcher found that the topic “A study on information and communication technology awareness among B.Ed. trainees in college of education in Pudukkottai district”, is promoting a behavioral change through awareness of ICT in education. ICT has undoubtedly become a powerful tool that is breaking the traditional methods of education. ICT based teaching learning process may lead to effectiveness and efficiency of educational system. Nowadays, most of the educational institutions have ICT facilities in their college

itself. They are sensitizing the relevance and importance of ICT in teacher education field. An attempt is made to study ICT awareness among B.Ed. Trainees. Based on the findings, the implications of the study are suggested.

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Application Of Markov Decision Process In Service Facility System

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Subject Area

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Key Words

Markov decision process, Periodic review, Lost sales, Optimal policy, Service facility system

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Abstract

This research paper aims to find an optimal policy for service facility systems with an attached inventory under periodic review and lost sales to directly enable cost optimization in an integrated model. Given the inventory level and the number of customers at any instant, our problem is to obtain an optimal policy using Markov Decision Process among several operating policies so as to minimize the long-run expected cost. Algorithm for optimal policy is presented and numerical example is given.

1. INTRODUCTION

Over the last decade research on complex integrated queueing - inventory systems or service facility systems has found much attention, often in connection with the research on integrated supply chain management. If a customer enters the service facility and sees all the waiting spaces occupied he/she will leave the facility, which results in both intangible losses (loss of goodwill) and tangible losses (loss in profit). An example is a car enters into service station for service (installation of bumpers). An entering car may leave the station for lack of waiting facility. As long as there are bumpers in inventory and lacks space available, installation of bumpers for cars can be performed. However, when no bumpers are available, service cannot be performed and cars have to leave the service system.

In a sequence of papers [1–5] Berman and his coworkers investigated the behaviour of service systems with an attached inventory. Their approach can be characterized as follows: Define a Markovian system inventory with waiting queue process and then use classical optimization methods to find the optimal control strategy. All these models assume that the demand, which arrives during the time the inventory is zero, is backordered. The models vary with respect to the lead time distribution, the service time distribution, waiting room

size, order size and reorder policy. Further a continuous review structure for the inventory is assumed in all these models.

At the present time, the number of systems using periodic review appears to be much greater than the number using transactions reporting. In some situations transactions may have been recorded as they occurred but were not transmitted to the decision maker in a form that could be used. In other cases it may be necessary to make an actual physical count of the inventory before any decisions are made. This will often be done when there is some form of transactions recording, because the recorded data may not be accurate enough for use. A typical example of this latter situation is a department store where the buyer will make a stock count, even though information from sales slips or tickets is available, for a variety of reasons, will often be considerably in error. It should be noted that in a service facility system, periodic review procedure will produce actual inventory counts by eliminating the errors arising from demands during service times and positive lead times.

A periodic review system will be said to have gone through one period's operation, in the time between two successive reviews. Several operating policies are possible in the case of periodic review systems, depending on the number of customers in the queue and inventory position at any review time. The aim of this paper is to find an optimal policy for service systems with an attached inventory under periodic review and lost sales to directly enable cost optimization in an integrated model. Given the inventory level and the number of customers at any instant, our problem is to obtain a policy so as to minimize the long-run expected cost. This paper is organized as follows. Section 2 deals with the formulation of the problem. Section 3 contains the analysis of the problem, forms the core of the paper. Algorithm for optimal policy is presented in Section 4 and numerical example is given in Section 5.

2. PROBLEM FORMULATION

Consider a service facility system in which items are stocked and delivered to the demanding customers waiting in a queue. The demand is for single item per customer. Customers arrive for service are served according to a FCFS queue discipline. The maximum inventory is assumed to be S . The inventory system for service facility involves periodic review procedure, with stochastic demands. The decisions taken at review times consists of ordering a certain amount $0 \leq j \leq S$, so as to bring the inventory level to the maximum level S . The economic consequences of the decisions are reflected in ordering, holding, reviewing and shortage costs. This gives rise to a system evolving over time where the probabilistic law of motion can be controlled by taking decision at review epochs.

2.1 Assumptions and Notations

- i.) Inventory positions are reviewed at equidistant time points $t = 0, T, 2T, \dots$
- ii.) A procurement is made at a review period only if the inventory level is less than
- iii.) the maximum level S , and replenishment is instantaneous.
- iv.) Customers arrive for service according to a Poisson process with rate $\lambda > 0$, and
- v.) service time is exponentially distributed with parameter $\mu > 0$, where $\lambda < \mu$.

- vi.) The buffer size in the queue is assumed to be finite N .
- vii.) The unsatisfied demands are considered as lost service.
- viii.) Let $I(t)$ and $Q(t)$ be the inventory level and the number of customers in the
- ix.) system respectively at time t .
- x.) Let K be the setup cost incurred whenever an order is placed to the supplier and h be
- xi.) the holding cost per item per period.
- xii.) The cost J of making the review at each time is independent of inventory level and
- xiii.) time duration T .
- xiv.) Let α be the cost of lost service and β be the waiting time cost per unit per unit time.

3. ANALYSIS

The process $X(t) = \{(I(t), Q(t)) : t \geq 0\}$ has state space $E = \{0, 1, 2, \dots, S\} \times \{0, 1, 2, \dots, N\}$

Define the actions

$$a = \begin{cases} 0 & \text{if no order is placed} \\ 1 & \text{if an order is placed with usual cost} \\ 2 & \text{if special order is placed with heavy cost} \end{cases}$$

Consider a stationary policy R which assigns action $a = R_{iq}$ to each state $(i, q) \in E$ where $i \in I$ and $q \in Q$. Let $A(i, q)$ is the set of decisions or actions for each state $(i, q) \in E$, which depends on the value of i and q at any review period. That is $A(i, q)$ is 0 if $i \geq q$ and takes the value 1 or 2 if $i < q$. Therefore

$$A(i, q) = \{0, 1, 2\}, \quad \forall \quad i \in I, q \in Q.$$

If at the n^{th} decision epoch (review epoch) the action a is chosen in state (i, q) , then the state (j, r) in the $(n+1)^{\text{th}}$ decision epoch depend only on the present state (i, q) and the subsequently chosen action a and are thus independent of the past history of the system. Thus the service system $\{X(t)\}$ under discussion follows Markov Decision Process.

Let $X_n = (i, q)$ and $X_{n+1} = (j, r)$ be the position of the system at n^{th} and $(n+1)^{\text{th}}$ decision epochs respectively, under the given stationary policy R .

Define $p_{iq}^{jr} = \Pr\{X_{n+1} = (j, r) | X_n = (i, q)\}$ the probability that at the next decision epoch the system will be in state $(j, r) \in E$ if action R_{iq} is chosen in present state (i, q) . Thus $\{X_n, n \geq 0\}$ is a markov chain with state space E . The n-step transition probabilities of the markov chain under policy R is given by

$$p_{iq}^{jr(n)}(R) = \Pr\{X_n = (j, r) | X_0 = (i, q)\} \text{ where}$$

$$p_{iq}^{jr(1)}(R) = p_{iq}^{jr}(R), p_{iq}^{iq(0)}(R) = 1 \text{ and}$$

$$p_{iq}^{jr(0)}(R) = 0 \text{ for } i \neq j, q \neq r.$$

Then $p_{iq}^{jr(n)}(R)$ satisfies the Kolmogorov forward differential equations. As each policy R , results in an irreducible markov chain and as the state and action spaces are finite, $p_{jr}(R) = \lim_{n \rightarrow \infty} p_{iq}^{jr(n)}(R)$ exists and is independent of the initial conditions [6]. A policy R is called a stationary if it is randomized, time invariant and Markovian. Further a process is said to be completely ergodic if every stationary policy give rise to an irreducible markov chain .

Define $X^{(R)}(t) = \{(I^R(t), Q^R(t)) : t \geq 0\}$, which denote the space $X(t) = \{(I(t), Q(t)) : t \geq 0\}$ where policy R is employed. From our assumptions it can be seen that for every stationary policy R , the Markov Decision Process $\{X^R(t)\}$ is completely ergodic. Since the action space, and the state space E are finite, a stationary optimal policy exists [7].

Define $V_n^R(i, q)$ as the total expected cost over the first n decision epochs, with initial state (i, q) and policy R is adopted. Then

$$V_n^R(i, q) = \sum_{t=0}^{n-1} (\sum_{(j,r) \in E} p_{iq}^{jr(t)}(R) c_{jr}(R_{jr}))$$

where $c_{jr}(R_{jr})$ is the cost incurred when the system visits state (j, r) which is given by

$$c_{jr}(R_{jr}) = J + K\bar{I}^R + c\alpha_1^R + \beta\alpha_2^R + \alpha\alpha_3^R$$

where $\bar{I}^R$ is the mean inventory level,

α_1^R is the mean reorder rate,

α_2^R is the mean waiting time for a customer and

α_3^R is the expected balking rate when policy R is adopted.

The limiting theorem on states of a markov chain , guarantees the existence of the limiting value $g_{iq}(R)$ and is given by

$$g_{iq}(R) = \lim_{n \rightarrow \infty} \frac{1}{n} V_n^R(i, q) \text{ for all } (i, q) \in E$$

which gives the long-run average expected cost per unit time. Since the markov chain $\{X_n, n \geq 0\}$ is a unichain which is irreducible, all its states are ergodic and a unique stationary distribution. Thus $\pi_{jr}(R) = \lim_{n \rightarrow \infty} \frac{1}{n} \sum_{t=1}^n p_{iq}^{jr(t)}(R)$ exists and is independent of initial state $(i, q) \in E$. The limiting probability distribution satisfies the system of equations:

$$\begin{aligned} P\pi &= \pi \\ \sum_{(i,q) \in E} \pi_{iq} &= 1 \end{aligned}$$

If we define

$$g(R) = \sum_{(j,r) \in E} c_{jr}(R_{jr}) \pi_{jr}(R) \text{ then}$$

$$\lim_{n \rightarrow \infty} \frac{1}{n} V_n^R(i, q) = g_{iq}(R) = g(R), \text{ independent of initial state } (i, q).$$

4. ALGORITHM FOR OPTIMAL POLICY

Our aim to find an optimal policy R^* such that $g_{iq}(R^*) \leq g_{iq}(R)$ for all stationary policies R and its existence is guaranteed. The relative value function $v_{iq}(R)$ plays a vital role in getting optimal policy. By the Policy improvement Theorem, if the stationary policy $\bar{R}$ satisfies

$$c_{iq}(\bar{R}_{iq}) - g(R) + \sum_{(j,r) \in E} p_{iq}^{jr}(\bar{R}_{iq}) v_{jr}(R) \leq v_{iq}(R)$$

for each $(i, q) \in E$, then the long - run average cost of policy $\bar{R}$ satisfies $g(\bar{R}) \leq g(R)$. Under the unichain assumption, we can now formulate the following **policy iteration algorithm**.

Step-1: Choose a stationary policy R for the periodic review service system with stochastic demand.

Step-2: For the current policy, compute the unique solution $(g(R), v_{iq}(R))$ to the following system of linear equations

$$v_{iq}(R) = c_{iq}(R_{iq}) - g(R) + \sum_{(j,r) \in E} p_{iq}^{jr}(R) v_{jr}(R)$$

for $(i, q) \in E$ and

$v_{ks} = 0$ for some state (k, s) arbitrarily chosen.

Step-3: For each state $(i, q) \in E$ determine an action a yielding the minimum in

$$\min_{a \in A(i, q)} \{c_{iq}(a) - g(R) + \sum_{(j,r) \in E} p_{iq}^{jr}(R) v_{jr}(R)\}.$$

The new stationary policy $\bar{R}$ is obtained by choosing $\bar{R}_{iq} = a$ with the convention that $\bar{R}_{iq}$ is chosen equal to the old action R_{iq} , when this action minimizes the policy improvement quantity.

Step-4: If the new policy $\bar{R} = R$ then the algorithm is stopped with policy R . Otherwise go to Step-2 with R replaced by $\bar{R}$.

5. NUMERICAL EXAMPLE

Consider a service facility system in which maximum inventory allowed is $S = 3$ and the maximum waiting capacity is $N = 3$, so that the state space

$$E = \{(3,3), (3,2), (3,1), (3,0), (2,3), (2,2), (2,1), (2,0), (1,3), (1,2), (1,1), (1,0), (0,3), (0,2), (0,1), (0,0)\}.$$

If $R^{(1)}$ be the initial policy applied to the system then for the states in E the policy is given by

$$R^{(1)} = (R_{33}^{(1)}, R_{32}^{(1)}, R_{31}^{(1)}, \dots, R_{i q}^{(1)}, \dots, R_{02}^{(1)}, R_{01}^{(1)}, R_{00}^{(1)}).$$

By the assumption we made, at any review epoch, an order is placed only if the inventory level is less than the queue length. That is if $i < q$. Therefore in $R^{(1)}$, the action 0 is

assumed for $R_{33}^{(1)}, R_{32}^{(1)}, R_{31}^{(1)}, R_{30}^{(1)}, R_{22}^{(1)}, R_{21}^{(1)}, R_{20}^{(1)}, R_{11}^{(1)}, R_{10}^{(1)}$ and $R_{00}^{(1)}$. So we have to find the optimal action only for $R_{23}^{(1)}, R_{13}^{(1)}, R_{12}^{(1)}, R_{03}^{(1)}, R_{02}^{(1)}$ and $R_{01}^{(1)}$.

The initial policy take action 1 if the inventory level is 2 or 1 and action 2 if the inventory level is 0. Let $c_{2j}R^{(1)} = c_{1j}R^{(1)} = 5$ and $c_{0j}R^{(1)} = 7$ for $j = 1, 2, 3$. The initial policy $R^{(1)}$ is given by

$$R^{(1)} = (0, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 0, 2, 2, 2, 0).$$

The one-step transition probabilities p_{iq}^{jr} from previous observations are given below.

$$p_{33}^{33} = 0.3 \quad p_{33}^{22} = 0.5 \quad p_{33}^{21} = 0.2$$

$$p_{32}^{31} = 0.3 \quad p_{32}^{21} = 0.5 \quad p_{32}^{20} = 0.2$$

$$p_{31}^{21} = 0.6 \quad p_{31}^{10} = 0.4$$

$$p_{30}^{20} = 0.5 \quad p_{30}^{10} = 0.5$$

$$p_{23}^{32} = 0.5 \quad p_{23}^{23} = 0.5$$

$$p_{22}^{22} = 0.3 \quad p_{22}^{11} = 0.5 \quad p_{22}^{00} = 0.2$$

$$p_{21}^{30} = 0.5 \quad p_{21}^{11} = 0.3 \quad p_{21}^{10} = 0.2$$

$$p_{20}^{21} = 0.4 \quad p_{20}^{20} = 0.3 \quad p_{20}^{11} = 0.3$$

$$p_{13}^{32} = 0.5 \quad p_{13}^{22} = 0.4 \quad p_{13}^{20} = 0.1$$

$$p_{12}^{31} = 0.6 \quad p_{12}^{21} = 0.4$$

$$p_{11}^{12} = 0.3 \quad p_{11}^{11} = 0.2 \quad p_{11}^{00} = 0.5$$

$$p_{10}^{10} = 0.5 \quad p_{10}^{00} = 0.5$$

$$p_{03}^{32} = 0.4 \quad p_{03}^{31} = 0.5 \quad p_{03}^{01} = 0.1$$

$$p_{02}^{30} = 0.5 \quad p_{02}^{21} = 0.5$$

$$p_{01}^{30} = 0.5 \quad p_{01}^{22} = 0.5$$

$$p_{00}^{10} = 0.5 \quad p_{00}^{00} = 0.5$$

and $p_{iq}^{jr} = 0$ otherwise.

For any given policy R , the policy improvement quantity is given by,

$$T_{iq}(a, R) = c_{iq}(a) - g(R) + \sum_{(j,r) \in E} p_{iq}^{jr} v_{iq}(R)$$

where $T_{iq}(a, R) = v_{iq}(R)$ for $a = R_{iq}$.

Iteration 1:

The linear equations connecting the average cost $g(R^{(1)})$ and the relative values $v_{iq}(R^{(1)})$ are given below:

$$v_{33} = 0 - g + 0.3v_{33} + 0.5v_{22} + 0.2v_{21}$$

$$v_{32} = 0 - g + 0.3v_{31} + 0.5v_{21} + 0.2v_{20}$$

$$v_{31} = 0 - g + 0.6v_{21} + 0.4v_{10}$$

$$v_{30} = 0 - g + 0.5v_{20} + 0.5v_{10}$$

$$v_{23} = 5 - g + 0.5v_{32} + 0.5v_{23}$$

$$v_{22} = 0 - g + 0.3v_{22} + 0.5v_{11} + 0.2v_{00}$$

$$v_{21} = 0 - g + 0.5v_{30} + 0.3v_{11} + 0.2v_{10}$$

$$v_{20} = 0 - g + 0.4v_{21} + 0.3v_{20} + 0.3v_{11}$$

$$v_{13} = 5 - g + 0.5v_{32} + 0.4v_{22} + 0.1v_{20}$$

$$v_{12} = 5 - g + 0.6v_{31} + 0.4v_{21}$$

$$v_{11} = 0 - g + 0.3v_{12} + 0.2v_{11} + 0.5v_{00}$$

$$v_{10} = 0 - g + 0.5v_{10} + 0.5v_{00}$$

$$v_{03} = 7 - g + 0.4v_{32} + 0.5v_{31} + 0.1v_{01}$$

$$v_{02} = 7 - g + 0.5v_{30} + 0.5v_{21}$$

$$v_{01} = 7 - g + 0.5v_{30} + 0.5v_{22}$$

$$v_{00} = 0 - g + 0.5v_{10} + 0.5v_{00}$$

By assuming $v_{33} = 0$ and solving, the relative values for the states (2,3), (1,3), (1,2), (0,3), (0,2) and (0,1) are given by

$$v_{23} = 9.6033; v_{13} = 4.8727; v_{12} = 4.3821; v_{03} = 7.1253; v_{02} = 6.4938 \text{ and } v_{01} = 6.7533.$$

Also the corresponding test quantities are given below:

$$T_{23}(1, R^{(1)}) = 9.6033; T_{23}(2, R^{(1)}) = 7.0$$

$$T_{13}(1, R^{(1)}) = 4.8727; T_{13}(2, R^{(1)}) = 7.0$$

$$T_{12}(1, R^{(1)}) = 4.3821; T_{12}(2, R^{(1)}) = 7.0$$

$$T_{03}(1, R^{(1)}) = 5.0; T_{03}(2, R^{(1)}) = 7.1253$$

$$T_{02}(1, R^{(1)}) = 5.0; T_{02}(2, R^{(1)}) = 6.4938$$

$$T_{01}(1, R^{(1)}) = 5.0; T_{01}(2, R^{(1)}) = 6.7533$$

Comparing the test quantities

$$T_{23}(1, R^{(1)}) \geq T_{23}(2, R^{(1)})$$

$$T_{13}(1, R^{(1)}) \leq T_{13}(2, R^{(1)})$$

$$T_{12}(1, R^{(1)}) \leq T_{12}(2, R^{(1)})$$

$$T_{03}(1, R^{(1)}) \leq T_{03}(2, R^{(1)})$$

$$T_{02}(1, R^{(1)}) \leq T_{02}(2, R^{(1)})$$

$$T_{01}(1, R^{(1)}) \leq T_{01}(2, R^{(1)})$$

This yields a new policy $R^{(2)} = (0,0,0,0,2,0,0,0,1,1,0,0,1,1,1,0)$.

Iteration 2:

The linear equations connecting the average cost $g(R^{(2)})$ and the relative values $v_{iq}(R^{(2)})$ are given below:

$$v_{33} = 0 - g + 0.3v_{33} + 0.5v_{22} + 0.2v_{21}$$

$$v_{32} = 0 - g + 0.3v_{31} + 0.5v_{21} + 0.2v_{20}$$

$$v_{31} = 0 - g + 0.6v_{21} + 0.4v_{10}$$

$$v_{30} = 0 - g + 0.5v_{20} + 0.5v_{10}$$

$$v_{23} = 7 - g + 0.5v_{32} + 0.5v_{23}$$

$$v_{22} = 0 - g + 0.3v_{22} + 0.5v_{11} + 0.2v_{00}$$

$$v_{21} = 0 - g + 0.5v_{30} + 0.3v_{11} + 0.2v_{10}$$

$$v_{20} = 0 - g + 0.4v_{21} + 0.3v_{20} + 0.3v_{11}$$

$$v_{13} = 5 - g + 0.5v_{32} + 0.4v_{22} + 0.1v_{20}$$

$$v_{12} = 5 - g + 0.6v_{31} + 0.4v_{21}$$

$$v_{11} = 0 - g + 0.3v_{12} + 0.2v_{11} + 0.5v_{00}$$

$$v_{10} = 0 - g + 0.5v_{10} + 0.5v_{00}$$

$$v_{03} = 5 - g + 0.4v_{32} + 0.5v_{31} + 0.1v_{01}$$

$$v_{02} = 5 - g + 0.5v_{30} + 0.5v_{21}$$

$$v_{01} = 5 - g + 0.5v_{30} + 0.5v_{22}$$

$$v_{00} = 0 - g + 0.5v_{10} + 0.5v_{00}$$

By assuming $v_{33} = 0$ and solving, the relative values for the states

(2,3), (1,3), (1,2), (0,3), (0,2) and (0,1) are given by $v_{23} = 13.60$; $v_{13} = 4.8727$; $v_{12} = 4.3821$; $v_{03} = 4.938$; $v_{02} = 4.6221$ and $v_{01} = 4.7533$. Also the corresponding test quantities are given below:

$$T_{23}(1, R^{(1)}) = 5.0; T_{23}(2, R^{(1)}) = 13.60$$

$$T_{13}(1, R^{(1)}) = 4.8727; T_{13}(2, R^{(1)}) = 7.0$$

$$T_{12}(1, R^{(1)}) = 4.3821; T_{12}(2, R^{(1)}) = 7.0$$

$$T_{03}(1, R^{(1)}) = 4.938; T_{03}(2, R^{(1)}) = 7.0$$

$$T_{02}(1, R^{(1)}) = 4.6221; T_{02}(2, R^{(1)}) = 7.0$$

$$T_{01}(1, R^{(1)}) = 4.7533; T_{01}(2, R^{(1)}) = 7.0$$

Comparing the test quantities

$$T_{23}(1, R^{(1)}) \leq T_{23}(2, R^{(1)})$$

$$T_{13}(1, R^{(1)}) \leq T_{13}(2, R^{(1)})$$

$$T_{12}(1, R^{(1)}) \leq T_{12}(2, R^{(1)})$$

$$T_{03}(1, R^{(1)}) \leq T_{03}(2, R^{(1)})$$

$$T_{02}(1, R^{(1)}) \leq T_{02}(2, R^{(1)})$$

$$T_{01}(1, R^{(1)}) \leq T_{01}(2, R^{(1)})$$

This yields a new policy $R^{(3)} = (0,0,0,0,1,0,0,0,1,1,0,0,1,1,1,0)$.

Iteration 3:

The linear equations connecting the average cost $g(R^{(3)})$ and the relative values $v_{iq}(R^{(3)})$ are given below:

$$v_{33} = 0 - g + 0.3v_{33} + 0.5v_{22} + 0.2v_{21}$$

$$v_{32} = 0 - g + 0.3v_{31} + 0.5v_{21} + 0.2v_{20}$$

$$v_{31} = 0 - g + 0.6v_{21} + 0.4v_{10}$$

$$v_{30} = 0 - g + 0.5v_{20} + 0.5v_{10}$$

$$v_{23} = 5 - g + 0.5v_{32} + 0.5v_{23}$$

$$v_{22} = 0 - g + 0.3v_{22} + 0.5v_{11} + 0.2v_{00}$$

$$v_{21} = 0 - g + 0.5v_{30} + 0.3v_{11} + 0.2v_{10}$$

$$v_{20} = 0 - g + 0.4v_{21} + 0.3v_{20} + 0.3v_{11}$$

$$v_{13} = 5 - g + 0.5v_{32} + 0.4v_{22} + 0.1v_{20}$$

$$v_{12} = 5 - g + 0.6v_{31} + 0.4v_{21}$$

$$v_{11} = 0 - g + 0.3v_{12} + 0.2v_{11} + 0.5v_{00}$$

$$v_{10} = 0 - g + 0.5v_{10} + 0.5v_{00}$$

$$v_{03} = 5 - g + 0.4v_{32} + 0.5v_{31} + 0.1v_{01}$$

$$v_{02} = 5 - g + 0.5v_{30} + 0.5v_{21}$$

$$v_{01} = 5 - g + 0.5v_{30} + 0.5v_{22}$$

$$v_{00} = 0 - g + 0.5v_{10} + 0.5v_{00}$$

By assuming $v_{33} = 0$ and solving, the relative values for the states (2,3), (1,3), (1,2), (0,3), (0,2) and (0,1) are given by $v_{23} = 9.6033$; $v_{13} = 4.8727$; $v_{12} = 4.3821$; $v_{03} = 4.925$; $v_{02} = 4.4938$ and $v_{01} = 4.7533$. Also the corresponding test quantities are given below:

$$T_{23}(1, R^{(1)}) = 9.6033; T_{23}(2, R^{(1)}) = 7.0$$

$$T_{13}(1, R^{(1)}) = 4.8727; T_{13}(2, R^{(1)}) = 7.0$$

$$T_{12}(1, R^{(1)}) = 4.3821; T_{12}(2, R^{(1)}) = 7.0$$

$$T_{03}(1, R^{(1)}) = 4.925; T_{03}(2, R^{(1)}) = 7.0$$

$$T_{02}(1, R^{(1)}) = 4.4938; T_{02}(2, R^{(1)}) = 7.0$$

$$T_{01}(1, R^{(1)}) = 4.7533; T_{01}(2, R^{(1)}) = 7.0$$

Comparing the test quantities

$$T_{23}(1, R^{(1)}) \geq T_{23}(2, R^{(1)})$$

$$T_{13}(1, R^{(1)}) \leq T_{13}(2, R^{(1)})$$

$$T_{12}(1, R^{(1)}) \leq T_{12}(2, R^{(1)})$$

$$T_{03}(1, R^{(1)}) \leq T_{03}(2, R^{(1)})$$

$$T_{02}(1, R^{(1)}) \leq T_{02}(2, R^{(1)})$$

$$T_{01}(1, R^{(1)}) \leq T_{01}(2, R^{(1)})$$

This yields a new policy $R^{(4)} = (0,0,0,0,2,0,0,0,1,1,0,0,1,1,0)$, which is same as the previous policy $R^{(2)}$. Hence the optimal policy is $\bar{R} = (0,0,0,0,2,0,0,0,1,1,0,0,1,1,0)$.

6. CONCLUSION

In a service facility system, given the inventory level and the number of customers at any instant, an algorithm to find an optimal policy among several operating policies is obtained.

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8. BIOGRAPHY



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Performance Analysis Of Wavelet Based Denoising Of Images Through Various Noises

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Abstract

This paper gives the review of the performance analysis of wavelet denoising applied on images contaminated with various noises. Wavelet based de-noising is one of the advance way of removing various noises usually present in images. Wavelet transform is used to convert the images to wavelet domain. Based on thresholding or shrinkage operations of coefficients in wavelet domain noise can be removed from images. In this paper, image quality matrices like PSNR and MSE have been compared for the various noises in images. Moreover, the performance of method with different types of noises has been shown with MATLAB based simulations. In the end wavelet based de-noising methods has been compared for hard and soft thresholding. So in this paper a review of denoising with wavelet domain under different conditions have been given.

1. INTRODUCTION

In the recent time it has been seen that one huge part of digital data consists of images. However in the process of acquisition or transmission of images, these often get corrupted by noises [1]. Denoising of images is essential part of digital image processing which focus

on removal of noise while retaining other features [2]. In literature there are various methods of denoising where conventional methods focus on linear techniques and recent on non-linear techniques. Many acquisition techniques introduce the various sorts of noises and artifacts. These corrupted parts introduce the undesired visual effects [5]. Moreover, Image denoising has a significant task in digital image processing [8]. One of the advance noise removal techniques for images is called as Wavelet thresholding is based on wavelet shrinkage [22]. Wavelet thresholding is a nonlinear technique. It is basic technique as it is based on selection of wavelet coefficients based on specific threshold. Donoho and Johnstone [12] have worked on various wavelets thresholding and shrinkage schemes for denoising [22]. Wavelet approach is one of the successful techniques for removal of noise as followed in literature in last decade. It has been proved that the use of wavelets successfully removes noise while preserving the signal characteristics, regardless of its frequency content [12]. In this paper, Section 1 is dealing with Introduction to de-noising of images, Section 2 with wavelet based denoising method, Section 3 provides the information about various types of noises and Section 4 is providing the MATLAB based analysis and in Section 5 conclusion has been given.

2. WAVELET BASED DENOISING

One of the ways of denoising the images is to transform the domain and removing the undesired effects in other domain. Methods used for it is thresholding i.e. soft and hard thresholding, discussed in further part. Wavelet transform based denoising approach is one of the successful techniques for removal of noises in images. It has been shown that the use of wavelets successfully removes noise while preserving the signal characteristics, despite of its frequency content [16]. Wavelet transformation decomposes the signal and image into multiscale resolution i.e. It is a multiresolution representation of signal and image in two dependant domains. Multiresolution analysis is possible due to the localization of the wavelet basis functions in both time and frequency domain. An effective filter design for specific application is possible with wavelet transform. Edge and sharp information is well maintained in wavelet decomposition. It leads to the very accurate results in edge detection. Moreover due to these properties it is very useful in image denoising and in related applications. In recent time wavelet based de-nosing has got its applications in many fields like biomedical, multimedia, satellite imaging etc. There are many wavelet functions like Haar, Symlets, Daubechies, Discrete Meyer Coiflets and biorthogonal which have been implemented for denoising[18]. DWT converts the signal into wavelet domain having number of coefficients where signal energy concentrate. So a noisy image is having multiple coefficients with high SNR (signal to noise ratio) and low SNR. Coefficients with low SNR can be filtered out and high SNR coefficients can be retained. The image can be reconstructed with inverse wavelet transform. So image can be restored to its original position [17]. The DWT is based on the hierarchy of sub bands spaced in frequency. It is represented by octave-band decomposition. DWT decomposes the image into four sub-bands which is implemented by separate applications of horizontal and vertical filters. Finest scale

coefficients are known as LH1, HL1 and HH1 and coarse level coefficients are known as LL1. This LL1 sub-band can be further decomposed to next coarse level of coefficients which would lead to next two level wavelet decomposition [16].

2.1 Wavelet Thresholding/Shrinkage

Wavelet Shrinkage or thresholding is useful in signal noise removal with the selection of desired DWT coefficients. It removes the noise by removing the coefficients relevant to specific threshold value. There are specific methods for selecting the threshold values. The method used for it is commonly called as Wavelet Shrinkage. Thresholding methods can be classified as hard or soft thresholding which are used for Wavelet based image denoising [19]. Hard and soft thresholding techniques have their own implementation rules. Hard thresholding is based on keep or kill rule, however introduces the artifacts. Soft thresholding is based on shrink and kill rule. Soft thresholding gives more visually pleasant image and reduces the abrupt sharp changes therefore in most of applications soft thresholding is preferred [20].

2.1.1 The Hard Thresholding Function

$$D(U, x) = U \text{ for all } |U| > x \\ = 0 \text{ otherwise}$$

2.1.2 The Soft Thresholding Function

$$D(U, x) = \text{sgn}(U) * \max(0, |U| - x)$$

In order to remove the noise a proper threshold value needs to be selected [9]. Selection of threshold is not an easy task. As if lower value of threshold is there it will pass all noisy components or if higher selected it will remove desired coefficients which could lead to loss of desired components results in artifacts [16]. There are various threshold selection procedures which have their own pros and cons. Universal Threshold is used if number of samples is large, then the universal threshold may give better estimate for soft threshold. Visu Shrink was introduced by Donoho. It follows hard threshold rule. One of the limitations of shrinkage is that neither speckle noise can be removed nor MSE can be minimized. It gives its good performance with additive noise. The Bayes Shrink method has been attracting attention recently as an algorithm for setting different thresholds for every sub band. Here subbands refer to frequency bands that are different from each other in level and direction [16]. Bayes Shrink uses soft thresholding.

3. NOISE MODELS

In order to analyze and to compare the performance of the filters a common noise Model is required. Noise is completely unpredictable and it may have various types which have been seen practically [14]. In this paper for the comparison different noise simulated models have been used which are mainly Speckle type noise, Poisson noise, Salt and pepper noise and Gaussian noise. This type of noise follows the Gaussian distribution. It is statistical noise that has its probability density function equal to that of the normal distribution, which is also known as the Gaussian distribution. Gaussian noise is randomly distributed over the signal. Each pixel in noisy image is the sum of true pixel value and a random Gaussian distributed

noise value [18]. Salt and pepper noise is a form of impulsive noise typically seen on images. It represents itself as randomly occurring white and black pixels. An effective noise reduction method for this type of noise involves the usage of a median filter or a mean filter. Salt and pepper noise creeps into images in situations where quick transients, such as faulty switching, take place. Salt and Pepper is an impulse type of noise and is also known as intensity spikes. It is generally caused due to errors in transmission. It has only two possible values, black or white. The probability of each is typically very less. The corrupted pixels are set alternatively to minimum or to maximum values giving the image Salt and Pepper like appearance. The unaffected pixels remain unchanged [11][18]. Poisson noise is image Data dependent. Non-linear response of the recorders and detectors introduces the Poisson noise. Detection And recording involve random electron emission which is having a Poisson distribution with a mean response value. It is considered that noise is having unity variance [18]. Speckle noise [21] is multiplicative noise. This type of noise occurs mostly in all coherent systems such as SAR images, Ultrasound images etc. This type of noise gives its effect in medical image processing .It involves the backscattered wave appearance which originates from many microscopic diffused reflections that passing through internal organs and makes it more difficult for the observer to discriminate fine detail of the images in diagnostic examinations. It follows the gamma distribution [5]. In medical image processing removal of such a type of noise is essential. In the further sections analysis and results have been shown by using these noise models [11][13].

4. SIMULATIONS AND ANALYSIS

In order to give the comparative analysis firstly performance of wavelet based denoising has been analysed. Moreover, performance of different methods of wavelet denoising has been compared with different noises with PSNR (Peak signal to noise ratio) and MSE (Mean square error). The ‘baboon.jpg’ (512 X 512) (RGB Coloured image) has been taken as a test image. MATLAB has been used to simulate the complete system and for implementing the hard as well as soft Wavelet thresholding.

Original Image 512 X 512

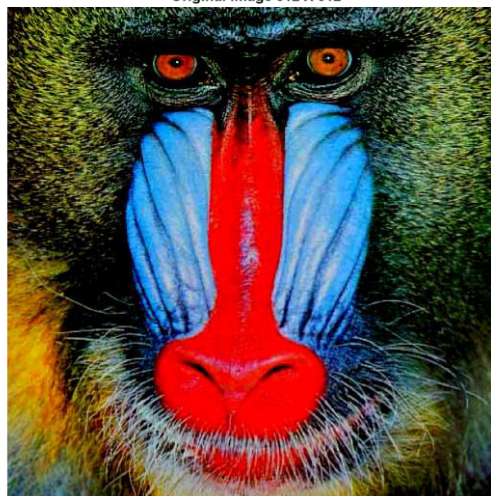
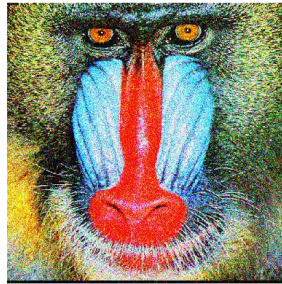
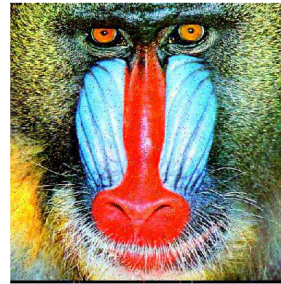


Figure 1: Original Test image

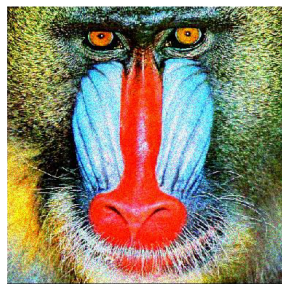
Gaussian Noise



Salt & Pepper Noise



Speckle Noise



Poisson Noise

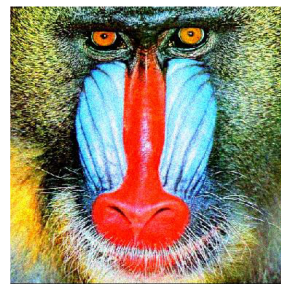


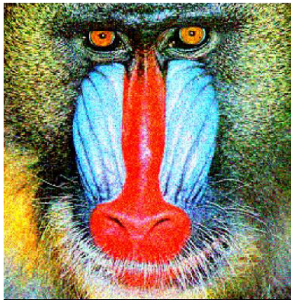
Figure 2: Noisy Images

4.1 Wavelet Denoising Analysis

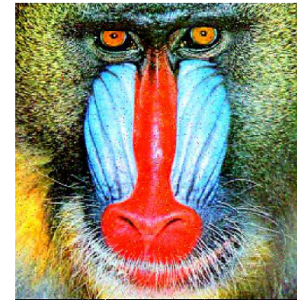
Here Thresholding based wavelet denoising method has been considered. It has been implemented in two ways one is hard and other is soft thresholding.

4.1.1 Soft Wavelet thresholding

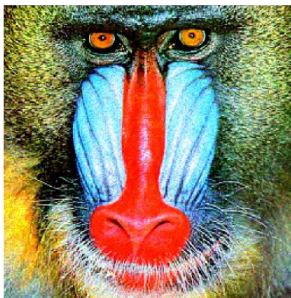
Wavelet(S) Filtered Gaussian Noise



Wavelet(S) Filtered Salt & Pepper Noise



Wavelet(S) Filtered Speckle Noise



Wavelet(S) Filtered Poisson Noise

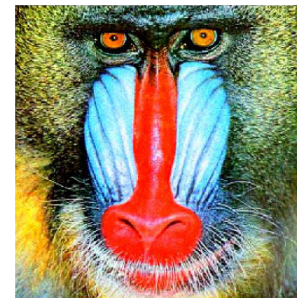


Figure 3: Wavelet Denoising with Soft Thresholding

4.1.2 Hard Wavelet thresholding

Wavelet(H)Filtered Gaussian Noise



Wavelet(H)Filtered Salt & Pepper Noise



Wavelet(H)Filtered Speckle Noise



Wavelet(H)Filtered Poisson Noise



Figure 4: Wavelet Denoising with Hard Thresholding

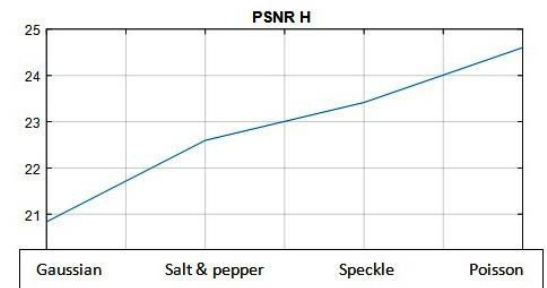
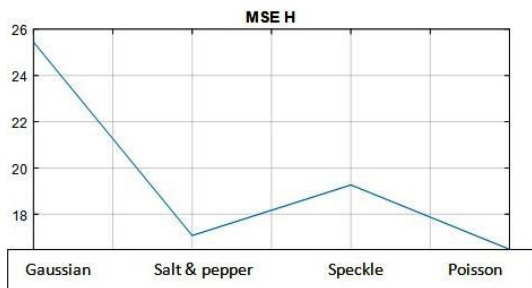
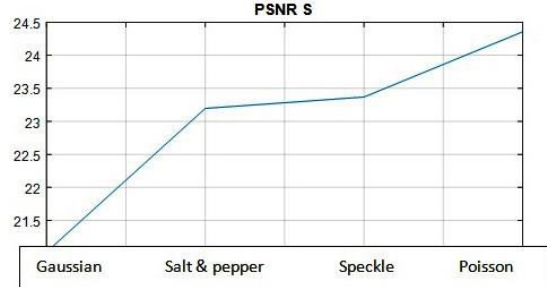
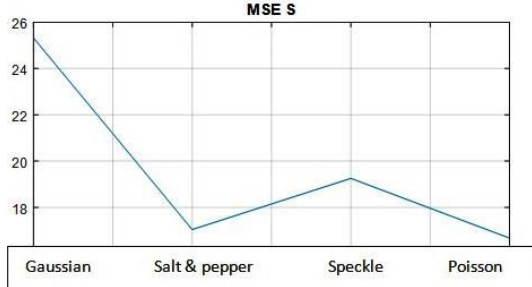


Figure 5: MSE and PSNR variations

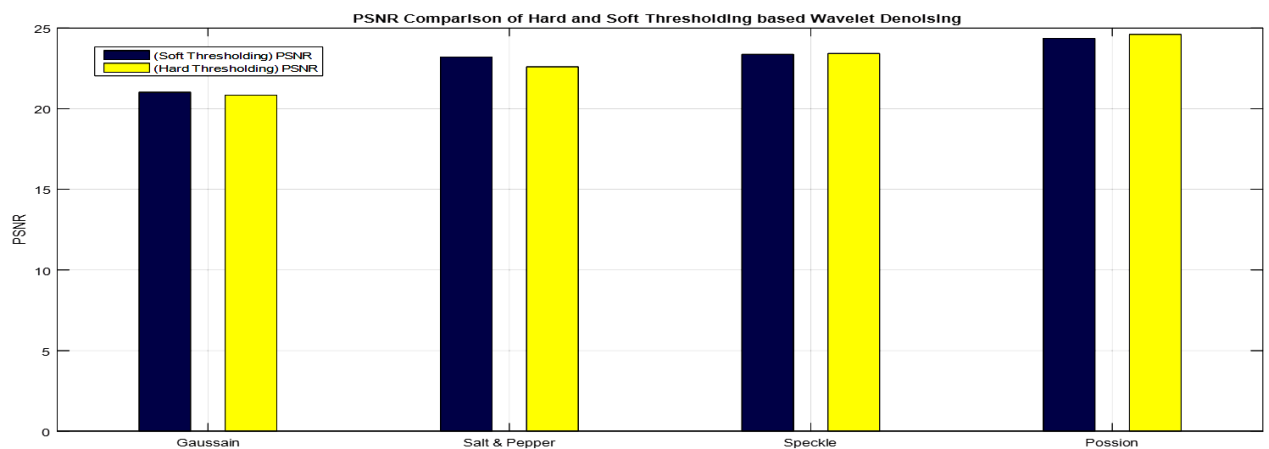


Figure 6: PSNR Comparison

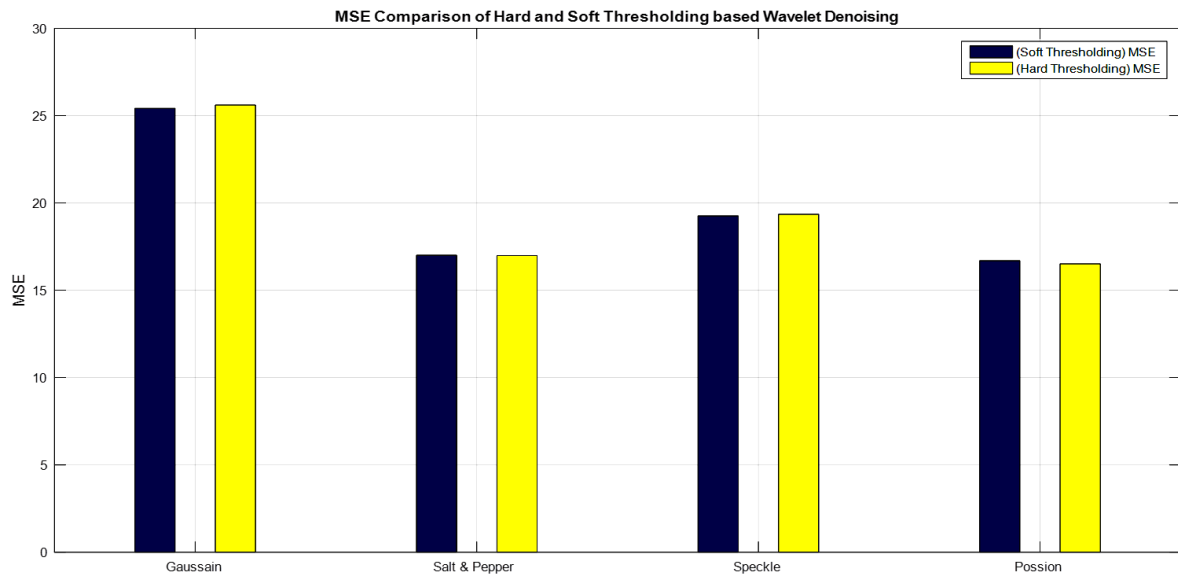


Figure 7: MSE Comparison of Hard and soft thresholding

Table 1: Comparison of Hard and soft thresholding (PSNR)

	Soft thresholding PSNR	Hard thresholding PSNR
Gaussian	21.0248	20.83987
Salt & Pepper	23.19622	22.59852
Speckle	23.36862	23.41752
Possion	24.35495	24.60326

Table 2: Comparison of Hard and soft thresholding (MSE)

	Soft thresholding MSE	Hard thresholding MSE
Gaussian	25.31942	25.44471
Salt & Pepper	17.03758	17.08436
Speckle	19.24921	19.27176
Possion	16.67009	16.48828

Table 3: Comparison of Hard and soft thresholding for same type of Noise

PSNR with Hard wavelet Denoising	MSE	SNR	PSNR with Soft Wavelet Denoising	MSE	SNR
20.83987	25.44471	15.51354	21.0248	25.31942	15.69846
22.59852	17.08436	17.27218	23.19622	17.03758	17.86988
23.41752	19.27176	18.09118	23.36862	19.24921	18.04228
24.60326	16.48828	19.27692	24.35495	16.67009	19.02861

It has been seen from the analysis that Soft thresholding performs the better than the hard thresholding method in terms of PSNR and MSE. Moreover appearance of images with soft thresholding is smoother. So, in wavelet based denoising methods soft thresholding method should be preferred.

5. CONCLUSION

In this paper performance analysis has been done for wavelet based filtering, applied on various images contaminated with different noises. It has been seen that there are variations in PSNR and MSE for different types of noises i.e. thresholding based denoising behaves differently with different types of noises. In the similar way PSNR and MSE have also been varying for the hard and soft thresholding with various types of noises. As an overall review of wavelet based denoising techniques, it gives an improved response as compared to other filters. Moreover with proper selection of thresholding method for Wavelet Thresholding, performance of wavelet based methods for image denoising can be further improved.

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Teacher Assisted Multimedia Instructional Package: An Indubitable Modus To Improve Attitude Towards Science Of Secondary School Students

Paper ID	IJIFR/V3/ E12/ 013	Page No.	4452-4462	Research Area	Multimedia Teaching
Key Words	Multimedia, Attitude Towards Science, Instructional Package				

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Abstract

The unpredicted growth of multimedia plays a prominent role in teaching. It bridges the gap between the teaching and learning processes in the Physics classroom by the fruitful realisation of the curricular objectives. The study purported to develop a Teacher-Assisted Multimedia Instructional Package in Physics and to test its effectiveness in improving Attitude towards Science of Secondary School Students of Kerala. Further, this effectiveness was to be compared with that of the Activity Oriented Method of Instruction. The Quasi Experimental Method with the Pre-Test Post-Test Non Equivalent Groups Design was found to be suitable for the study. The Teacher-Assisted Multimedia Instructional Package and the Activity Oriented Method of Instruction were the independent variables while the Attitude towards Science was the dependent variable of the study. The experiment was conducted on a sample of 400 Secondary School Students of Kerala with 200 each in the Experimental and Control Groups. The results of the study showed that the Teacher-Assisted Multimedia Instructional Package in Physics is more effective than the Activity Oriented Method of Instruction in improving Attitude towards Science of the Students. The study yielded similar findings with regard to the Gender Groups of Students, viz. Boys as well as Girls.

1. BACKGROUND OF THE STUDY

Education is a never ending process and it permeates every aspect of an individual's life. It makes our life progressive, cultured and civilized. Education today is more than teaching and learning with an emphasis on technology. Science is an inseparable part of modern life. It is viewed by common man as a body of scientific information. The conventional teaching methods do not meet up to the intellectual, psychological and emotional needs of the students and are insufficient to actively involve students in studying Science. The methods of teaching need a radical change and it should be more student-centered. An appropriate educational technology in the hands of competent teachers can ensure better teaching learning process and that facilitates longer retention.

Multimedia has gained a paramount importance in any classroom. The challenge for educators is to determine the appropriateness of multimedia use and ensure its success in the classroom. In the classroom, Multimedia should be used as a tool rather than as a novelty. Multimedia has an undisputed place but certainly will not replace good teaching. Schools are perhaps the best places for tapping the potentials of multimedia. Many educators perceive multimedia as a panacea to all educational woes. Multimedia has been touted as the preferred medium in revolutionizing education. Lots of new technologies are emerging in the field of teaching Physics, with ongoing research in teaching Physics using Multimedia. The role of Multimedia is also evident in the documentation of Physics practices. Most of the teachers practice traditional methods for teaching Physics. Since the classrooms are crowded, the teachers are unable to capture the attention of the students. Consequently, the percentage of marks and percentage of passes in a year, with regard to Physics, is obviously poor. Interactive Multimedia is an answer to this situation. Multimedia can be a powerful tool when used by an experienced teacher who understands that technology is the vehicle and not the message. When the teacher is able to understand the role that multimedia plays in the classroom, learning can not only be interesting but meaningful.

Physics is a subject that gives meaning to nature and natural phenomena. It is essential that students be taught in the natural set up. Though the traditional method of teaching helps to some extent, Multimedia is capable of motivating students towards self-achievement. For example, when the concept of rotation and revolution of planets is to be taught, Multimedia animation comes in handy. When the concept of gravitation due to any planet and universal gravitation constant is explained, graphics and animation are useful in driving home the idea of natural phenomena in a clear cut way. In magnetism, it is not known in which direction the magnetic attraction and repulsion is made, but this could be clearly conveyed using Multimedia.

2. NEED & SIGNIFICANCE OF THE STUDY

Multimedia is a popular technology that serves as a communication facilitator; it also serves as an instructional delivery medium. The conception of the Multimedia as a learning environment is instantiated in varied forms, from online versions of traditional computer assisted instruction to innovative individual and group virtual – learning modes. Teacher-

Assisted Multimedia Instruction is a powerful interaction medium that enables students to communicate with peers, teachers, and experts and conduct collaborative work (Mioduser, 2000). Teacher-Assisted Classroom Instruction is a method in which the teacher will contact the suitable web site and collect more and recent information related to a topic and use it in the classroom teaching. Abstract ideas can be explained easily with 3D pictures, animation and Multimedia.

Many studies have concluded that the emergence of Multimedia technology and graphics have provoked educationists to re-evaluate the system of education and examine the need of technology in near future. Multimedia significantly increased the *expansion of* and *impact on* online teaching and learning (Kramer, 2000 as cited Zhao, 2003). Most of the Multimedia programmes for educational purpose create situations such that Students can interpret information for their own understanding (Kumar and Hebttemariam, 2010). Experimental evidence by Priya (2012), Abbas (2011) and Baby (2013) support the notion that Multimedia Instructional Packages are associated with performance to improve the Science Learning Interest and Attitude towards Science. The results of the study conducted by Ercan (2014) shows that the Multimedia Learning Package promotes more effective learning in science education. These results point to the fact that Multimedia has high significance and immense prospects in shaping the Attitude towards Science of students in the field of Science education. Attitude towards Science is the participation of the students in scholastic activities. Proper development of Instructional Package in Physics can be ensured by making students feel that Multimedia is an important object of instruction. This can be done only by means of an effective method of Instruction. A Multimedia Instructional Package is so versatile by nature and that they have become dispensable to teachers, students as well as student teachers. It bound to have profound influence on the Attitude towards Science of students. Further, it could foster and motivate the students towards learning the subject.

The Investigators, both having long innings in the field of Teaching, felt that Secondary School Students have very little Attitude towards Science. Several researchers have developed various instructional strategies in Physics for Secondary School Students, but none was found that could improve Attitude towards Science. So it was decided to develop a Teacher-Assisted Multimedia Instructional Package to improve Attitude towards Science of Secondary School Students. In the present study, a Teacher-Assisted Multimedia Instructional Package in Physics for Secondary School Students was developed and its effectiveness tested in improving the Attitude towards Science of Secondary School Students of Kerala.

3. HYPOTHESIS OF THE STUDY

It was hypothesised that the Teacher-Assisted Multimedia Instructional Package will be significantly more effective than the Activity Oriented Method of Instruction in improving Attitude towards Science of Secondary School Students for the Total sample as well as for their Gender Sub Samples.

4. OBJECTIVE OF THE STUDY

The objective of the study was to compare the effectiveness of the Teacher-Assisted Multimedia Instructional Package and that of the Activity Oriented Method of Instruction in improving Attitude towards Science among Secondary School Students for the Total sample as well as for their Gender Sub Samples.

5. METHODOLOGY IN BRIEF

The Quasi Experimental Method with the Pre-Test Post-Test Non Equivalent Groups Design was adopted for the present study. The Teacher-Assisted Multimedia Instructional Package and the Activity Oriented Method of Instruction were the independent variables while Attitude towards Science was the dependent variable of the study. Experimental verification was imperative to determine the effectiveness of the Teacher-Assisted Multimedia Instructional Package over the Activity Oriented Method of Instruction on Attitude towards Science of Secondary School Students.

Random Sampling Technique was employed for gathering data giving due representation to Gender of students. The total sample comprised 400 Secondary School Students, with 200 each in the groups randomly assigned as the Experimental and Control Groups, from schools in Thrissur and Ernakulam Districts of Kerala. The materials used for the experiment were:

- i.) Teacher-Assisted Multimedia Instructional Package(Jaise and Murali, 2011)
- ii.) Lesson Plans based on Activity Oriented Method of Instruction (Jaise and Murali, 2011)

They were developed from three Units of the Physics Textbook of Standard VIII, viz. Magnetism, Static Electricity and Celestial Sights.

The tools used for the study were:

- i.) Evaluation Pro forma for Validating the Teacher-Assisted Multimedia Instructional Package (Jaise and Murali, 2011)
- ii.) Scale of Attitude towards Science (Suresh and Joseph, 1996)

The Scale of Attitude towards Science was initially administered to the Experimental and Control Groups in order to assess the Attitude towards Science of Secondary School Students. The scores obtained were taken as the Pre-Test scores. The Experimental Group was exposed to the Teacher-Assisted Multimedia Instructional Package while the Control Group was exposed to the Activity Oriented Method of Instruction. After experimental treatment, the Scale of Attitude towards Science Inventory was again administered on both Experimental and Control Groups. The scores obtained thus were considered as Post-Test scores.

The data gathered was then analysed using statistical techniques like Arithmetic Mean, Standard Deviation, Critical Ratio (Test of Significant Difference between Means), and Tests of Variance, viz. Analysis of Variance (ANOVA) as well as Analysis of Covariance (ANCOVA).

6. FINDINGS AND DISCUSSIONS OF RESULTS

A comparison was made of the effectiveness of the Teacher-Assisted Multimedia Instructional Package and the Activity Oriented Method of Instruction on the Attitude towards Science of Secondary School Students for the Total Sample as well as for both the Gender Groups. The Pre-Test, Post-Test and Gain scores in Attitude towards Science of the Total Sample as well as of both the Gender Sub Samples in the Experimental and Control Groups were computed and the data are given in Table 1.

Table 1: Data for Pre-Test, Post-Test and Gain scores in Attitude towards Science of Total Sample and of Gender Sub Samples in Experimental and Control Groups

Samples	Groups		N	Pre-Test Scores			Post-Test Scores			Gain Scores		
				M	SD	t value	M	SD	t value	M	SD	t value
Total Sample	Experimental		200	62.69	4.94	1.30	77.68	6.97	14.61	14.99	7.30	14.09
	Control		200	61.92	6.78		68.42	5.65		6.51	4.37	
Gender Sub Samples	Boys	Experimental	98	62.65	6.14	1.32	76.77	6.62	8.46	14.11	6.63	9.52
		Control	87	63.81	5.84		69.91	4.25		6.10	4.74	
	Girls	Experimental	102	60.99	4.74	0.65	78.55	7.23	12.14	17.56	8.58	11.54
		Control	113	60.46	7.11		67.27	6.30		6.81	4.05	

From Table D, for df 198(Total), df 183(Boys) and df 213(Girls), $t_{0.01}=2.59$

Table 1 shows that the obtained 't' values with regard to the Pre-Test Scores in Attitude towards Science of the Total Sample, of the Boys, as well as of the Girls are 1.30, 1.32 and 0.65 respectively, which are not significant. From these results, it can be inferred that there is no significant difference between the Pre-Test scores of the Total Sample, of the Boys, as well as of the Girls in the Experimental and Control Groups before the Experiment. Since the Means and Standard Deviations of the Experimental and Control Groups are almost similar in value, it can be concluded that the Total Sample as well as both the Gender Sub Samples of Secondary School Students are almost identical with regard to their Pre-Test scores in Attitude towards Science.

Table 1 also shows that the obtained 't' values with regard to the Post-Test Scores in Attitude towards Science of the Total Sample, of the Boys, as well as of the Girls are 14.61, 8.46 and 12.14 respectively, which are significant at 0.01 level. From these results, it can be inferred that there is significant difference between the Mean Post-Test scores of the Total Sample, of the Boys, as well as of the Girls in the Experimental and Control Groups after the Experiment. Since the Mean Post-Test scores of the Experimental Group (77.68, 76.77 and 78.55) are greater than those of the Control Group (68.42, 69.91 and 67.27) for the Total Sample, for the Boys, and for the Girls respectively, it can be concluded that the Teacher-Assisted Multimedia Instructional Package is superior to the Activity Oriented Method of Instruction for the Total Sample as well as for their Gender Sub Samples.

From Table 1, the obtained 't' values with regard to the Gain Scores of the Total Sample, of the Boys, as well as of the Girls are 14.09, 9.52 and 11.54 respectively, which are significant at 0.01 level. From these results, it can be inferred that there is significant difference between the Mean Gain scores of the Total Sample, of the Boys, as well as of the Girls in the Experimental and Control Groups. Since the Mean Gain scores of the Experimental Group (14.99, 14.11 and 17.56) are greater than those of the Control Group (6.51, 6.10 and 6.81) for the Total Sample, for the Boys, and for the Girls respectively, it can be concluded that the Teacher-Assisted Multimedia Instructional Package is superior to the Activity Oriented Method of Instruction for the Total Sample as well as for their Gender Sub Samples.

The Tests of Variance were used to ascertain the genuineness of the difference in the obtained Scores. The Total Sum of Squares, Mean Square Variance and F-ratio for the Pre- and Post-Test scores of Experimental and Control Groups were computed for the Total Sample as well as for both the Gender Sub Samples and the details of Analysis of Variance are shown in Table 2.

Table 2: Summary of ANOVA of Pre-Test (x) and Post-Test (y) Scores in Attitude towards Science of Total Sample and of Gender Sub Samples in Experimental and Control Groups

Samples		Source of Variation	df	SS _X	SS _Y	MS _x	MS _Y	F _X	F _Y
Total Sample		Among Means	1	60.06	8565.50	60.06	8565.50	1.71	212.93
		Within Groups	398	14008.33	16010.59	35.19	40.23		
		Total	399	14068.39	24576.09				
Gender Sub Samples	Boys	Among Means	1	61.11	2167.08	61.11	2167.08	1.69	68.36
		Within Groups	183	6587.88	5800.87	35.99	31.69		
		Total	184	6648.99	7967.95				
	Girls	Among Means	1	15.06	6814.73	15.06	6814.73	0.40	149.49
		Within Groups	213	7935.06	9709.75	37.25	45.59		
		Total	214	7950.12	16524.48				
Result:			F _X values are not significant F _Y values are significant at 0.01 level						

From Table F, for df 398 (Total), $F_{0.05} = 3.86$ and $F_{0.01} = 6.70$
 From Table F, for df 184 (Boys) and 213 (Girls), $F_{0.05} = 3.89$ and $F_{0.01} = 6.76$

Table 2 shows that the obtained F_X values are 1.71, 1.69 and 0.40 for the Total Sample, for the Boys, and for the Girls respectively, all of which are less than the Table values and hence are not significant. This indicates that there is no significant difference between Pre-Test scores of the Total Sample, of the Boys and of the Girls, in the Experimental and Control Groups. The obtained F_Y values are 212.93, 68.36 and 149.49 for the Total Sample, for the Boys and for the Girls respectively, all of which are greater than the Table values and are significant at 0.01 level. The significant F_Y values indicate that the Experimental

and the Control Groups differ significantly in the Post-Test scores of Attitude towards Science.

The Total Sum of Squares and Adjusted Mean Square Variance for Post-Test scores of Attitude towards Science for the Total Sample as well as for the Boys and the Girls are computed and the results of Analysis of Covariance are presented in Table 3.

Table 3: Summary of ANCOVA of Pre-Test (x) and Post-Test (y) Scores in Attitude towards Science of Total Sample and of Gender Sub Samples in Experimental and Control Groups

Samples		Source of Variation	df	SS _X	SS _Y	SS _{XY}	SS _{YX}	MS _{YX}	SD _{YX}	F _{YX}
Total Sample		Among Means	1	60.06	8565.50	717.26	7751.64	7751.64	5.42	263.88
		Within Groups	397	14008.33	16010.59	7804.99	11661.91	29.38		
		Total	398	14068.39	24576.09	8522.15	19413.55			
Gender Sub Samples	Boys	Among Means	1	61.11	2167.08	-363.92	2499.61	2499.61	4.89	104.71
		Within Groups	182	6587.88	5800.87	3097.46	4344.52	23.87		
		Total	183	6648.99	7967.95	2733.54	6844.13			
	Girls	Among Means	1	15.06	6814.73	320.36	6468.86	6468.86	5.95	182.75
		Within Groups	213	7935.06	9709.75	4183.28	7504.37	35.39		
		Total	214	7950.12	16524.48	4503.64	13973.23			
Result: All the F _{YX} values are significant at 0.01 level										

From Table F, for df 397(Total), $F_{0.01} = 6.70$; df 183(Boys), $F_{0.01} = 6.76$ and for df 212(Girls), $F_{0.01} = 6.72$

Table 3 shows that the obtained F_{YX} values for the Total Sample, for the Boys and for the Girls are 263.88, 104.71 and 182.75 respectively, all of which are greater than the Table values, and hence the differences between the two Groups are significant at 0.01 level for the Total Sample as well as for their Gender Sub Samples.

From the results of ANCOVA pertaining to Attitude towards Science of the Total Sample as well as of both the Gender Sub Samples, the significant F-ratios for the Adjusted Post-Test scores show that the scores of students in the Experimental Group and in the Control Group differ significantly after they have been Adjusted for Differences in the Pre-Test scores. The significant F-ratios necessitate that the differences be tested separately by the calculation of Adjusted Mean scores (t-test). The Adjusted Means for the Post-Test scores of Total Sample as well as of their Gender Sub Samples in the Experimental and Control Groups were computed and the data are given in Table 4.

Table 4: Data for Adjusted Means of Post-Test Scores in Attitude towards Science of Total Sample and of Gender Sub Samples in Experimental and Control Groups

Samples		Groups	N	MX	MY	Adjusted Mean	‘t’ value	P
Total Sample		Experimental	200	62.69	77.68	77.46	16.33	P < 0.01
		Control	200	61.92	68.42	68.64		
Gender Sub Samples	Boys	Experimental	98	62.65	76.77	77.04	10.28	P < 0.01
		Control	87	63.80	69.91	69.64		
	Girls	Experimental	102	60.99	78.55	78.41	13.58	P < 0.01
		Control	113	60.46	67.27	67.41		
Result: All the ‘t’ values are significant at 0.01 level								

From Table D, for df 397(Total), $t_{0.01} = 2.59$. df 182(Boys), $t_{0.01} = 2.60$ and df 212(Girls), $t_{0.01} = 2.59$

From Table 4, it can be seen that the 't' values obtained are 16.33, 10.28 and 13.58 respectively for the Total Sample as well as for the Boys and for the Girls, all of which are significant at 0.01 level. The results of Adjusted Means pertaining to Attitude towards Science for the Total Sample as well as for the Boys and the Girls in the Experimental Groups (77.46, 77.04 and 78.41 respectively) are greater than those of the Control Groups (68.64, 69.64 and 67.41 respectively). These points to the fact that students in the Experimental Group are superior to those in the Control Group with regard to Attitude towards Science for the Total Sample as well as for both the Gender Sub Samples. It may therefore be inferred that the students who were exposed to the Teacher-Assisted Multimedia Instructional Package have improved their Attitude towards Science as compared to those who were exposed to the Activity Oriented Method of Instruction. In other words, the Teacher-Assisted Multimedia Instructional Package is more effective than the Activity Oriented Method of Instruction in improving Attitude towards Science among Secondary School Students for the Total Sample as well as for both the Gender Sub Samples.

7. CONCLUSION

The above results show that there is significant difference in Attitude towards Science with regard to the Total Sample as well as both the Gender Sub Samples of Secondary School Students in the Experimental Group. Those students who were exposed to the Teacher-Assisted Multimedia Instructional Package show higher Attitude towards Science as compared to those who were exposed to the Activity Oriented Method of Instruction. Such findings could only be attributed to the Teacher-Assisted Multimedia Instructional Package that must have motivated and helped the students to improve their Attitude towards Science. Furthermore, the findings of this study are supported by researches of Joseph (1996), Germann and Aram (2006), Fah (2008), Felita (2008), Pinar and Filiz (2010), Remziye, Yeter, Calis, Ozdilek, Sirin and Meral (2011), Devadasa (2013)

as well as Baby (2014). Thus, the study concludes that the Teacher-Assisted Multimedia Instructional Package is very effective in improving Attitude towards Science among Secondary School Students.

8. EDUCATIONAL IMPLICATIONS OF THE STUDY

The findings of the study have certain educational implications that are outlined below:

- Instructional Packages based on Multimedia need to be developed so as to help Students to be aware of the changes in education arising from technological advances which in turn will go a long way in positively influencing their Attitude towards Science.
- Facilities must be provided in educational institutions to organise Multimedia classes. Digital content that is meaningful, culturally responsive and has high quality must be made available for use of both teachers and students. This will have high prospects for influencing the Attitude towards Science of students.
- Multimedia Instructional Packages will help to turn Teacher-centred lessons into Student-centred ones. Such a shift in focus is likely to bring about a vast change in the Attitude towards Science of students.
- Multimedia enables the science teachers to provide our students with experiences of variable difficulty, randomness and simulating nature.
- Multimedia classes will provide teachers with a platform for sharing the subject matter as well as the scope of the feedback.
- The Teacher-Assisted Multimedia Instructional Package provides a successful platform to convey concepts effectively and help the students to improve their Attitude towards Science. This Package also helps to actively participate in the learning process.
- Innovative Multimedia based instructional strategies and materials should be provided among Secondary School teachers. They should be encouraged to use Multimedia in their teaching.
- Proper multimedia instructional packages help the students to empower and enhance their self-esteem.

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Impact And Importance Of Video Assisted Instruction On The Education Of The Children With Learning Disability

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KeyWords	Video Assisted Instruction, Learning Disabilities Children Achievement, Teaching Fundamental Mathematical Concepts				

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Abstract

Among the several types of teaching technologies here the investigators aimed at the effects of 'Video Assisted Instruction' in enhancing the teaching- learning process of the children with learning difficulty in the field of arithmetic. Few studies in the late 90s revealed that the positive contribution of VAI played the vital role in improving their achievement at the primary level. Here the investigators attempted to find out the impact and importance of VAI towards education and achievement of the L.D children in arithmetic. This research focus on study the significant difference if any in the achievement of LD children learnt fundamental mathematical concepts through VAI strategy with regard to variation of their background variables considered for the study.

1. INTRODUCTION

It is well known that every classroom has various categories of children with different levels of learning potentialities as well as learning difficulties. Some learn any subject content in a very fast manner and some children feel the learning task a difficult, are slow in learning and achieve lower records/grades in academic subjects. These type of children have

problems in mainly 3Rs, i.e; Reading, Writing, Arithmetic. This 'invisible' difficulty is termed as 'Learning Disability'. It is specially used to point out a specific group of children, adolescents and adults who have problems in 'learning'. These problematic children feel highly difficult to cope up with school academic tasks. Here the terms 'Learning Difficulties' refer to the children with 'learning disability'. Even the teachers also feel in cross roads in identifying this kind of children, to teach a particular concept to them and make them to understand. The earlier literature on 'learning disability' reports that 10% of the population are estimated as the children with learning disability (Jayanthi Narayanan, 1999). In India, the L.D prevalence rate varied from as low as 1 per cent to 20 percent (Rajaguru, S.; (2001). As far as the education to this type of children is concerned, the teachers' role is highly valuable. The teachers ought to alter their teaching methodology as per the needs of the L.D children.

But the children as well as the teachers are unaware of them and follow monotonous method of teaching in the classroom that leads to ambiguity as it confuses not only the teachers but also the learners. Hence it is realized that systematic teaching technologies and approaches are to be provided to the teachers in order to make them capable of identifying the L.D children, diagnosing their inabilities and alternating the teaching strategies for the children. Nowadays in our country through SSA, SSA(IED), RMSA the government puts forth its serious efforts to overcome these type of difficulties encountered by the differently abled children.

2. STATEMENT OF THE PROBLEM

To study the effects of VAI in the learning of the L.D children, the investigators intended to estimate the "Impact and importance of Video Assisted Instruction" on the education of the children with learning disability. This study aims to estimate the improvement in the achievement of the L.D children after the intervention of VAI.

3. CONCEPT OF L.D CHILDREN

In 1962 Samuel Kirk introduced the concept "Learning disabilities" is not concerned with children who have sensory handicaps, such as the deaf or the blind, or with children who are mentally retarded. The child can be considered as learning disabled if he/she

- Has considerable difficulty in understanding or using spoken language, reading, writing, spelling and/or arithmetic during the developmental period.
- Is free from visual hearing or motor disability, mental retardation, severe emotional problems.
- Has adequate facilities of interest and motivation to l

3.1 Concept of Video Assisted Instruction

Video Assisted Instruction provides considerable visualization of objects and process, which is very essential for better perception of concepts. It also provides unique experience to the slow learners in the presentation of instructional content. VAI enriches the understanding and expedites the mastery of the concept. The investigator used video lesson getting from

DIET, Palayampatti applies the video assisted instructional strategy is of great value in the better achievement made by children in learning fundamental mathematical concepts at the primary level. In this study, the investigator developed number of teaching aids and also used the standard materials available to learn fundamental mathematical concepts.

4. OBJECTIVES OF THE STUDY

- To identify the LD children in the primary level.
- To develop VAI package for teaching fundamental mathematical concepts to the L.D children.
- To study the effectiveness of using video lesson in teaching fundamental mathematical concepts.
- To study the significant difference if any in the achievement of LD children learnt fundamental mathematical concepts through VAI strategy with regard to variation of their background variables considered for the study.

5. HYPOTHESES OF THE STUDY

There is no significant difference in the achievement of learning disabled children in learning fundamental mathematics, learnt through VAI strategy and on-going educational process with respect to their sex, age and parents' educational status.

6.METHODOLOGY

The investigators adopted the following techniques for this study:

- i.) Maline's intelligence scale for Indian school going children
- ii.) Pre-test achievement score before the intervention of VAI of L.D children
- iii.) Post-test achievement score of L.D children
- iv.) Assessment inventory for Teachers'

6.1 Sample of the study

The investigators adopted 'Purposive sampling technique' for this study. 46 out of 388 children screened after Maline's mental ability test and school half-yearly test score were identified as children with Learning Disabled and selected as Sample for the study who were studying in nine middle schools in Aruppukottai block.

6.2 Tools used for the study

- i.) Maline's mental ability test
- ii.) Consideration of L.D's school test score
- iii.) Consideration of L.D.C's post test score
- iv.) Teachers' assessment inventory record (based on Likert's five point scale) concentrating on their school

6.3 Data gathering procedure

The investigators directly involved in (i) identifying the children with learning disability, (ii) conducting pre-test in Arithmetic, (iii) imparting video assisted instruction, (iv) conducting post-test in Arithmetic after the intervention of VAI. After conducting

Maline's mental ability test and concentrating on their school records 42 children were identified as children with learning difficulty in the field of mathematics (dyscalculia).

7. ANALYSIS AND INTERPRETATION OF DATA

The investigators adopted 'descriptive statistics' to find out mean and standard deviation and differential statistics to find out the 't' value to estimate if there is any significant difference among the background variables. Here it is also noted

Table 1: 't' value to estimate

S. No.	Test	N	Mean	S.D	S.E	't' value
1.	Pre-Test	42	23.5	2.43	0.58	4.43**
2.	Post-Test	42	26.07	2.82		

** denotes significant difference at 0.01 level.

9. FINDINGS

- i.) Generally speaking absolutely there is significant difference between the two test scores before and after the intervention of Video Assisted Instruction of the Learning Disabled children those who were considered here as sample.
- ii.) There is also significant difference in learning disabled children's achievement before and after the intervention of Video Assisted Instruction with regard to their background variables sex, age, parents' educational status.
- iii.) Irrespective of their background variables, VAI strategy helps the children with learning difficulties to achieve better in learning arithmetic.

10. IMPLICATIONS OF THE STUDY

The outcome of an experimental study such as this present study will be extremely useful for the field of special education. A comprehensive survey can be conducted by NCERT, SCERT and DIET at different levels to get the holistic picture about the prevalence of children with learning difficulties. Such survey will facilitate to draw the need based training program to the teachers. This study reveals the importance of identifying the children with learning difficulties is mostly essential for both the teachers and the learners. It also emphasised the importance of the Video Assisted Instruction for the improvement of the slow learners and the children with learning difficulty (dyscalculia and acalculia)

11. RECOMMENDATIONS

- i.) NCERT, SCERT and DIET will have to conduct training programs to the special educators at different levels to identify the children with learning difficulty.
- ii.) Every school should have a psychological laboratory as well as mathematical laboratory.
- iii.) It is highly essential a school should be provided with Audio-Visual aids, video projector and audio-visual laboratory.

12. CONCLUSION

At the early hours the children have to be intervened by the psychological tests to find out their intellectual ability and lacuna. Identifying as well as stamping the child as `Learning Disabled` is an arduous task. Those have to be carried out very carefully. After that the teachers have to alter their methodology of teaching in order to benefit the children with learning disability. Video assisted instruction here is found more valuable in the learning of the children with L.D.

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Academic Anxiety And Academic Self-Regulation In Relation To Academic Achievement Of Adolescents

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Abstract

About three decades back the excellence in academic performance was viewed in terms of scores alone irrespective of the basic potential. Achievement refers to that level of attainment which does measure up to the potential capabilities of the individual. Some students are high achievers and some are low achievers. There are many factors responsible for achievement like academic self-regulation, academic anxiety, study habits, attitude toward teacher, attitude toward education, school and home background, concentration, mental conflicts, level of aspiration, self-confidence, examination fear etc. the academic achievement, academic anxiety and academic self-regulation are probable reasons which affect achievement of the students. Academic achievement has remained very significant factor in adolescent's life because it leads to the employment of the individual. Hence, parent, teacher and student in the present era remain very conscious and anxious about academic achievement. Different policies and strategies have been framed to enhance it. Through this study a humble effort is made.

1. INTRODUCTION

Education is the most important invention of mankind. It is education which transformed man from 'two legged animal' into human being. It is a process of human enlightenment and empowerment for the achievement of a better and higher quality of life. It is a never ending process of inner growth and development. Its period stretches from cradle to grave. It may be seen as any modification brought about in the behavior of an individual as a result of his interaction with the environment. Thus, education is to draw out rather than to put in.

School education is important for every child. During school a child studies many subjects like English, Hindi, Punjabi, Social Studies, Science and Mathematics. In school education child get training in 3R's which are reading, writing and arithmetic. All subjects have their relevant importance. The 20th century has been called the age of anxiety but concerns about fear and anxiety are as old as humanity itself. Although, fear has been of interest since ancient times, anxiety was not fully recognized as a distinct and pervasive human condition until shortly before beginning of the century.

On the increase, anxiety seems to be crapping up everywhere today. A seemingly permanent fixture in many people's lives, anxiety not only affects the mind but body as well.

But it was Freud (1946) who first proposed a critical rate for anxiety in personality theory. For Freud, anxiety was "something felt", specifies unpleasant emotional state of condition of the human organism that included experimental psychological and behavioural components. Anxiety is similar to a messenger because it alerts one's body when something is wrong or worth your attention. Academic anxiety is a kind of anxiety which relates to the impending danger from the environments of the academic institutions including teacher and certain subjects like mathematics, science, English etc. It is a mental feeling of uneasiness or distress in reaction to a school situation that is perceived negatively.

The relationship between anxiety and impaired academic achievement has been well documented by a number of investigators (Sharma and Rao; 1984, Sud and Sharma, 1989; Sud 1994; Sud and Sharma, 1990). Anxiety is common symptom found in different population especially among students. Anxiety is a special variety of fear experience in response to an anticipated threat of self-esteem. Further (Hussain, 1977; Gupta, 1987; Ramachandran, 1990; Namarta, 1992; Alberto et al., 1997; Chapell, 2005; and Parvathamma, 2010) found that high academic anxiety had adverse effect on academic performance. Pamod (1996) concluded that boys manifest more future orientations than girls, therefore boys had more academic anxiety. Bryme (2000) suggested that males present significant decrease of anxiety and fear in 12th grades instead of girls who show increase in anxiety and by this time both males and females use different coping strategies in order to deal with fear and anxiety. Pomerantz et al. (2002) studied that pattern of gender differences. Girls outperformed boys across all four subjects but were more prone to internal distress than boys were. Girls doing poorly in school were the most vulnerable to internal distress. However, even girls doing well in school were more vulnerable than boys were. Even a study conducted by Ojha (2005) revealed that 25% boys have extremely high anxiety whereas only 6.7% girls have high academic anxiety. Yousefi et al. (2010)

determined the relationship between test- anxiety and academic achievement among adolescents in Iran. Results showed that there was a significant correlation between test anxiety and academic achievement. Self-regulation is an active way of managing behavior to achieve a goal. Self-regulation is necessary for a person to have self-control and ability to inhibit actions. In other words, self-regulation is a person's self-control of behavior, emotions and thoughts. Scholars define self-regulation as a systematic process of human thoughts. Scholars define self-regulation as a systematic process of human thoughts that involves setting personal goals and steering oneself toward the achievements of those goals. It is a central feature of social cognition and important in goal setting, work motivation, learning and education.

According to Zimmerman (1989), self-regulation is the process whereby students activate and sustain cognitions, behaviours and affects that are systematically oriented toward the attainment of goals. Zimmerman has given four dimensions of self-regulation i.e., Academic, pro-social, religion and friendship self-regulation. Amongst them academic self-regulation is having effect.

2. OPERATIONAL DEFINITIONS

- I. **Academic Anxiety:** Academic anxiety is a kind of state anxiety which relates to the impending danger from the environment of the academic institutions including teacher, certain subjects like mathematics, English etc. as measured by Singh and Sengupta's Academic Anxiety Scale.
- II. **Academic Achievement:** An academic achievement is the degree or level of success or that proficiency attained in some specific areas concerning scholastic or academic work. Academic achievement is measured by percentage of marks obtained in previous class i.e., students who studied in 9th grade, his 8th grade marks are taken as academic achievement.
- III. **Academic Self-regulation:** According to Zimmerman, self-regulation is the process whereby students activate and sustain cognitions, behaviours and effects that are systematically oriented toward the attainment of the goals. Its dimensions are: academic, pro-social, religion and friendship self-regulation. Investigator used academic self-regulation questionnaire developed by Ryan and Connell in 1998 to measure scores of academic self-regulation of school students which is based upon Zimmerman's work. "Self-regulation is not a mental ability or an academic performance skill, rather it is the self-directive process by which learners transform their mental abilities into academic skills" (p.65).

3. RESEARCH TOOLS USED

- (i) Academic Anxiety Scale for Children by Singh and Sengupta (1984).
- (ii) Academic Self-Regulation questionnaire developed by Ryan and Connell (1998).

4. OBJECTIVES OF THE RESEARCH

- i.) To study academic achievement, academic anxiety and academic self-regulation of

adolescents.

- ii.) To identify high and low level of adolescents on academic achievement.
- iii.) To compare academic anxiety of adolescents having high and low academic achievement.
- iv.) To compare academic self-regulation of adolescents having high and low academic achievement.
- v.) To find out correlation between academic achievement and academic anxiety of adolescents.
- vi.) To find out correlation between academic achievement and academic self-regulation of adolescents.
- vii.) To find out correlation between academic anxiety and academic self-regulation of adolescents.

5. HYPOTHESES OF THE STUDY

- i.) The adolescent have average level of academic achievement, academic anxiety and academic self-regulation.
- ii.) There is no significant difference of academic anxiety of high and low group of adolescents on academic achievement.
- iii.) There is no significant difference in academic achievement between high achievers and low achievers on academic achievement.
- iv.) There is no significant difference in academic anxiety between high achievers and low achievers on academic achievement.
- v.) There is no significant difference in academic self-regulation between high achievers and low achievers on academic achievement.
- vi.) Academic anxiety and academic achievement are significantly correlated.
- vii.) Academic achievement and academic self-regulation are significantly correlated.
- viii.) Academic anxiety and academic self-regulation are significantly correlated.

6. DELIMITATIONS OF THE STUDY

- i.) The sample delimited for four schools from the urban area of Patiala district.
- ii.) The adolescents were delimited to IXth class only.

7. SAMPLE SELECTED FOR THE STUDY

Sample of 200 adolescents from four schools of Patiala district were randomly selected. Out of selected 200 students for the study, 100 boys and 100 girls were taken. Out of these four schools, two schools selected were affiliated from PSEB and two schools are affiliated from CBSE.

8. DATA ANALYSIS & INTERPRETATION

- I. **Academic achievement** among adolescents has been studied by taking the CGPA of the students and then converted into percentages as per the formula given by CBSE and the

frequency distribution is presented in table 1:

Table 1: Academic Achievement of Total 200 Students

Class Interval		Frequency			
91-93		60			
86-90		29			
81-85		5			
76-80		43			
71-75		5			
66-70		1			
61-65		24			
56-60		12			
51-55		2			
46-50		18			
40-45		1			
Mean	Median	Mode	SD	Kurtosis	Skewness
76.16	77.16	75.05	15.22	-0.72	-0.68

Table 1 shows the frequency distribution of adolescents on the variable of academic achievement. It reveals the mean of total group of 200 students as Academic Achievement is 76.16 with SD 15.22, median 77.16, mode 75.05, kurtosis -0.72 and skewness -0.68 respectively. 94 students lie above the mean and 63 Students lie below the mean. It shows the large number of students have average high level of academic achievement. The data have been put into relief in Fig.1.

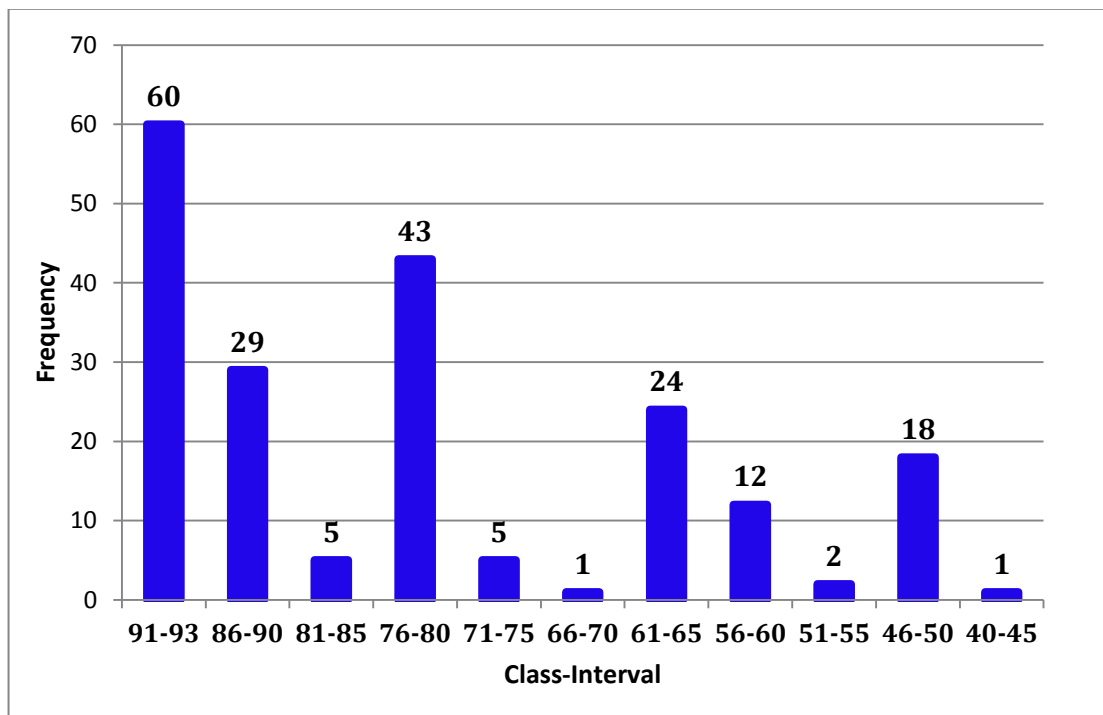


Figure 1: Academic Achievement of Total 200 Students

II. Academic Anxiety of adolescents

Table 2: Academic Anxiety of total 200 students

Class Interval		Frequency			
16-17		2			
14-15		13			
12-13		18			
10-11		63			
8-9		104			
Mean	Median	Mode	SD	Kurtosis	Skewness
9.74	9	8	1.90	1.92	1.41

Table 2 shows the frequency distribution of adolescents on the variable of Academic Anxiety. It reveals the mean of total group of 200 students as Academic Anxiety is 9.74 with SD 1.90, median 9, mode 8, kurtosis 1.92 and skewness 1.41 respectively. Out of 200, 33 students lie above the mean and 104 students lie below the mean. As per manual norms, of 9.74 lies in less anxious category. The value of median is less than mean so that, the distribution is positively skewed. This is also shown in Fig.2.

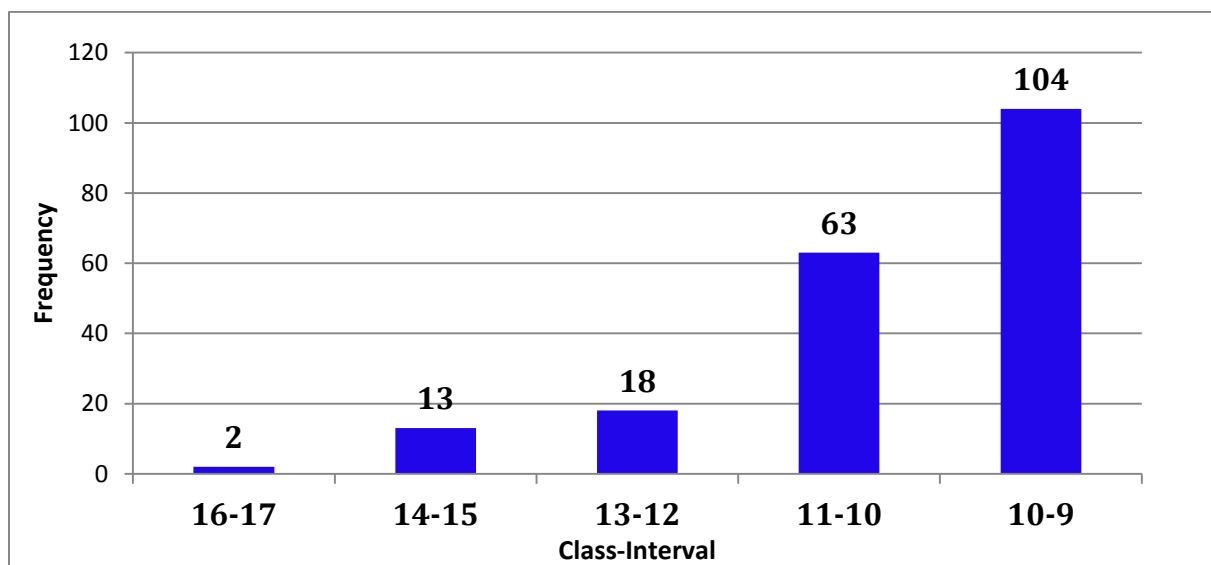


Figure 2: Academic Anxiety of Total 200 Students

III. Academic Self-Regulation of adolescents

Table 3: Academic Self-Regulation of total 200 students

Class Interval	Frequency
104-108	8
99-103	4
94-98	7
89-93	42
84-88	79

79-83				41	
74-78				0	
69-73				10	
64-68				0	
79-63				9	
Mean	Median	Mode	SD	Kurtosis	Skewness
85	86	90	8.86	2.68	-0.84

Table 3 shows the frequency distribution of adolescents on the variable of Academic Self-regulation. It reveals the mean of total group of 200 students as Academic Self-regulation mean is 85 with SD 8.86, median 86, mode 90, kurtosis 2.68 and skewness -0.84 respectively. 61 students lie above the mean and 60 students lie below the mean. It shows that 9th class students having average level of academic self-regulation. Graphical representation of data is done in Fig.3.

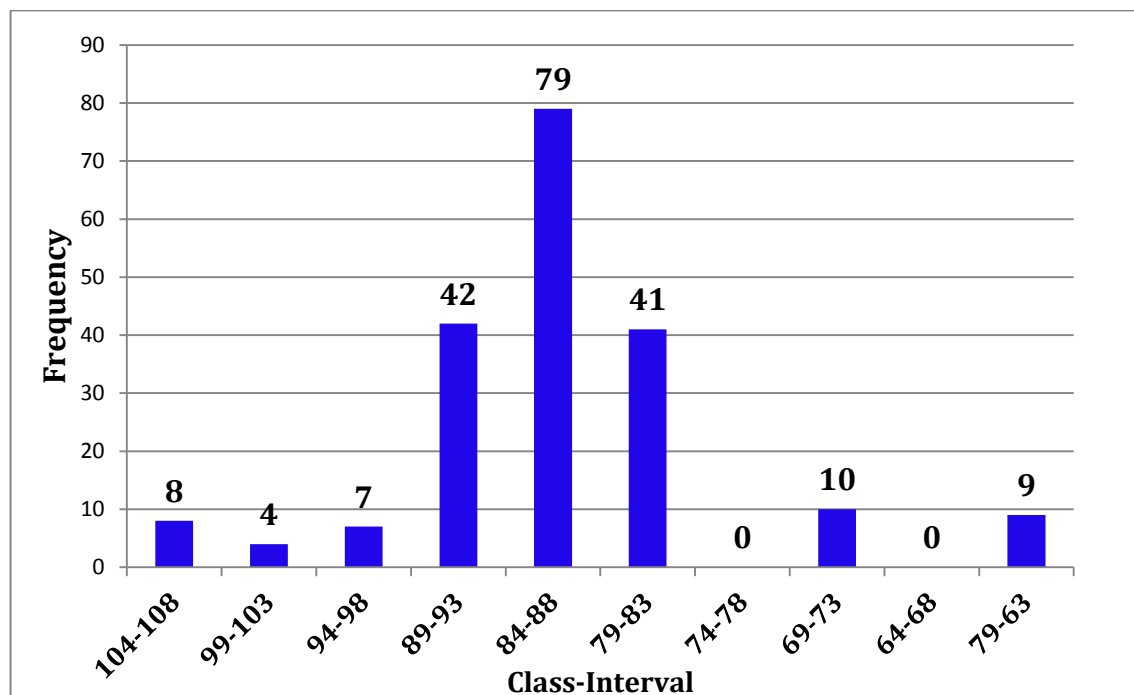


Fig. 2: Academic Self-Regulation of Total 200 Students

IV. Identification of high and low groups on academic achievement.

To identify high and low level of groups on academic achievement, the investigation calculated 27% above and 27% below group of students on the bases of Academic Achievement. It is inferred that students belonging to score 91.71 or above fall in the high group of Academic Achievement and adolescents have score of 54.58 or below fall in the low category of Academic Achievement. 54 students, thus, fall in high Academic Achievement and 54 students fall in low academic achievement.

V. Comparison of high and low groups of adolescents on academic anxiety.

Table 4: High and low groups of adolescents on academic anxiety

Academic Achievement	N	Mean	SD	t-ratio
High Level	54	9.94	1.26	2.73*
Low Level	54	9.01	1.89	

* Significant at 0.1 level

Above table shows that mean of academic anxiety of high achiever students is 9.94 and SD is 1.26. The mean of academic anxiety lower achiever students is 9.04 and SD is 1.89. The t-ratio is 2.73, which is significant. It is found that high achiever and low achiever students differ significantly in academic anxiety. Table presents that high achiever group has more anxiety than their counterparts.

VI. Comparison of high and low groups of adolescents on self-regulation

Table 5: High and low groups of adolescents on self-regulation

Academic Self-regulation	N	Mean	SD	t-ratio
High Level	54	85.6	9.74	0.57**
Low Level	54	84.5	8.82	

** Not significant at 0.01 level.

Above table shows that mean of academic self-regulation of high achiever students is 85.6 and SD is 9.74. The mean of academic self-regulation lower achiever students is 84.5 and SD is 8.82. The t-ratio is 0.57, which is not significant at 0.01 levels. It is found that high achiever and low achiever students do not differ significantly in academic self-regulation.

VII. Relationship Of Different Variables

Table 6: Correlation of Academic Achievement with Academic Anxiety and Academic Self-Regulation of Adolescents

	Group		Coefficient of Correlation
Correlation	Academic Achievement	Academic Anxiety	0.77
Correlation	Academic Achievement	Academic Self-regulation	0.87
Correlation	Academic Anxiety	Academic Self-regulation	0.77

Table 6 shows that correlation of academic achievement and academic anxiety as 0.77. It reveals the significant relationship of academic achievement and academic anxiety. It means if students have high academic achievement then they will have high academic anxiety and vice versa. Correlation between academic achievement and academic self-regulation as 0.87. It also shows that the significant relationship of academic achievement and academic self-regulation. It means if students have high academic achievement then they will have high academic self-regulation and vice versa. Correlation between academic

anxiety and academic self-regulation is 0.77. It shows the significant and positive relationship of academic anxiety and academic self-regulation. It means if students have high academic anxiety they will have high academic self-regulation and vice versa.

On the basis of above findings, researchers may conclude that academic achievement of a person highly influences academic anxiety and academic self-regulation.

9. DISCUSSION AND CONCLUSIONS

- (i) Nearly 47% school students are having high level of academic achievement and nearby 21.5% students possess moderate level of academic achievement. On the other extreme 31.5% possess low level of academic achievement. This finding shows that one-third of the students in the school they do not achieve upto the desired level. Despite of the efforts should be made by students and Parents but they do not achieve the high level of academic achievement. Tetlar (2014) also revealed that large number of students is having high academic achievement.
- (ii) Almost 16.5% school student have extremely high academic anxiety. About one-third i.e., 31.5% students possess moderate academic anxiety level. On the other hand, large number of students (52%) possesses low and very low level of academic anxiety respectively. Kvedere (2013) and Yaratan (2012) revealed that students are having low level of academic anxiety. Who are having high academic anxiety separate study should be done to find out the reasons of high academic anxiety. It may be due to the reasons that parents having high expectations from them.
- (iii) Near 30.5% school students are have high level of academic self-regulation. Large number of school students i.e., near about 39.5% possesses average level of academic self-regulation. 30% student possesses low level of academic self-regulation. Self-regulation has been important factor for the development of the individual. The 70% are having either low or moderate level of academic self-regulation. Zimmerman and schunk (2008) also revealed that low level of self-regulation. Societies can grow if the citizens have the quality of self-regulation.
- (iv) Academic anxiety of the students having high academic achievement and low academic achievement is significant. The reason may be students who are conscious or anxious about their academic achievement score high. This study is quite in line with the study made by Neelam and Atri (2013).
- (v) There existed no significant different in academic self-regulation of high and low groups of adolescents on academic self-regulation.
- (vi) The correlation between different variables shows that higher the academic achievement, higher the self-regulation and higher the academic anxiety. The same has been found it. Mokshi (2007) and Vitsari (2010) revealed that academic anxiety significantly related with academic achievement.

10. EDUCATIONAL IMPLICATIONS

The result of the present study put forward the following educational implications:

- Present study shows that most students lie in average level of academic achievement. This is not a healthy sign of any effective educational system. Hence, in order to do so and to meet out every student's instructional requirements, the teacher should be acquainted with use of various audio-visual teaching aids, making practical demonstrations, innovative teaching strategies etc. Teacher should try to find out the cause of low achievers and the findings have implications for the teachers, parents as well as government should engage in programs that can motivate the students to improve their academic achievement.
- Study further shows that approximately one-fourth of the students are having high academic anxiety. In order to reduce the academic anxiety among students, teacher should act as a guide and helper during the course of study. This can be achieved by employing grade system and to give less academic work and assignments.
- Findings of the present study show that approximately 30% of the students have average or low academic self-regulation. In order to enhance the self-regulation, teachers should help to develop self-regulation among adolescents. It is a true fact that academic self-regulation can only make individual live a happy life.

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Determining The Geometrical Pattern For Applying Adhesive For A Brake Shoe Joint While Minimizing The Grammage Per Unit Area

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KeyWords	Brake Shoe, Brake Liner, Adhesive Joint, Computational Methodology, Pattern, Shear Strength				

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Abstract

The adhesive joint for the disc brake shall be the subject of study for this dissertation work. The brake system is expected to endure the shear forces during braking at the operating speed of the vehicle. The adhesive joint shall be analyzed using computational tool in the CAE domain - Hyperworks. The virtual model for the brake shoe joint shall consist of the base, the liner and the adhesive layer keeping the mating parts in place. Pre-processing for analysis shall be carried out using Hyper Mesh while generating suitable mesh and assigning the loads and boundary conditions for the Finite Element Model. The FE model shall be solved using RADIOSS/ Optistruct followed by post-processing using Hyper View. The geometry or the configuration of the adhesive layer shall be altered to investigate three variants – Horizontal stripes, vertical stripes and criss-cross stripes. The results shall be reviewed with a plan for experimentation for the suitable variant. Realizing the objective of using minimal adhesive to perform the intended function shall be the focus of this work.

1. INTRODUCTION

Disc brake consists of cast-iron disc which rotates with the wheel, pad is fixed and friction material. When the braking process occurs, the hydraulic pressure forces the piston and therefore pads and disc brake are in sliding contact. Disc brakes are widely used on cars because of their better heat dissipation ability; a direct result of the exposed friction surface. The friction surface of a drum brake is inside and heat dissipation relies upon heat being conducted through the drum so car manufacturers fit drum brakes only on the rear axle of “low” performance cars. Additionally a drum brake provides a very effective parking brake. So, the front brakes of a typical passenger car have to be designed to provide large amounts of braking torque, and withstand large amounts of heat generated, heat transfer, high temperatures and thermal loading.

Set up force resists the movement and the vehicle slows down or eventually stops. Friction between disc and pads always opposes motion and the heat is generated due to conversion of the kinetic energy. The disc brake is a wheel brake which slows rotation of the wheel by the friction caused by pushing brake pads against a brake disc with a set of callipers to stop the wheel, friction material in the form of brake pads, mounted on a device called a brake pads, is forced mechanically, hydraulically, pneumatically or electromagnetically against both sides of the disc. Friction causes the disc and attached wheel to slow or stop. Brakes convert motion to heat, and if the brakes get too hot, they become less effective, a phenomenon known as brake fade.



Figure 1: Typical layout of brake assembly

Non-asbestos organic fiber reinforced metallic friction composites are increasingly being used in automotive brake disc pads, shoes, linings, blocks, clutch facings, and so forth, primarily because of awareness of health hazards of asbestos.

2. LITERATURE REVIEW

- I. Neha B Thakre , A B Dhumne The need to design lightweight structures and the increased use of lightweight materials in industrial fields, have led to wide use of adhesive bonding. Recent work relating to finite element analysis of adhesively bonded joints is reviewed in this paper, in terms of static loading analysis, fatigue loading analysis and dynamic characteristics of the adhesively bonded joints. In this work fabrication of joint using Msflat plate will be done. The joint will be made by welding, riveting and adhesive bonding process. Adhesive bond will be created by using epoxy as an adhesive material. The numerical calculation will be done for the experimental analysis. Computational

analysis will be comprises of stress, buckling and vibrational analysis. Result of experimental analysis will be validating with computational analysis.

- II. Prashant Sudhiranjan Rade, Dr. Dheeraj S. Deshmukh, Swapnil S. Kulkarni :This dissertation work is aimed to investigate the adhesive joint shear strength for a braking system. The problem is investigated using mathematical analysis as well as analytical methodology with Finite Element Analysis. The dissertation has is presented with variants of different adhesive layer thickness proposed for the shear strength investigation of adhesive joint to be used in the automotive industry. In FEA, the competent software 'NASTRAN' is used for determining the shear stress induced in different thickness of adhesive layer applied between brake pad and brake shoe. Comparative study for the methodologies is presented while arriving at the most suitable variant of the brake shoe with respect to the thickness of the adhesive layer and the geometry manifested by the pattern of the adhesive layer applied. A total of five variants with different adhesive layer thickness are analysed for concluding the thesis work.
- III. Mamhood Hasan Dakhil, A. K. Rai, P. Ravinder Reddy & Ahmed Abdulhasen Jabber :This paper presents optimized design of performance of disc brake using finite element analysis is to evaluate the performance under severe braking conditions. Cast iron and stainless steel are used as disc brake materials. ANSYS 12.0 is a dedicated Finite element package used for determining the temperature distribution, variation of stresses and deformation across the disc brake. It has been made to investigate the effect of the temperature distribution with the deformed shape and stress distribution of disc brake rotor design by using different braking conditions. From the results of the above data, the service life and long term stability is ensured. A steady static structure analysis has been carried out to investigate the temperature variation across the disc using the axis symmetric finite elements. Further structural analysis is also carried out by Coupled Field Analysis. An attempt is also made to suggest a best combination of material, flange width and wall thickness used for disc brake rotor, which yields a low temperature variation across the rotor, less deformation and minimum Von-mises stress possible.
- IV. Debora C Moreira and Luiz CS Nunes, Flexible adhesives play an important role in various applications. The possibility of bonding dissimilar substrates has generated wide interest in flexible adhesives. However, most of the theoretical and experimental investigations have focused on rigid epoxy adhesives. The purpose of this work is to investigate the mechanical behaviour of a flexible adhesive joint in the overlap region. Aluminium adherents were used for single lap joint made with an adhesive characterized by high flexibility and large strains. The specimen was tested in tension. Full-field displacements of the overlap region were measured by the Digital Image Correlation method. A large shear strain of the order of 48% was observed. Small transverse deflections of the adherents were estimated. Also, it was observed that the shear strain distribution in the adhesive layer decreases at the overlap ends, which is different from previously reported results in the literature.

3. PROBLEM DEFINITION

The brake shoe joint while being resistant to shear forces may also address the aspect of economy. Prima facie, the quantity of adhesive per unit might seem negligible since only a few grams of adhesive needs to be applied for effecting a secure joint. The perception, although, is not the same when a couple of thousand units need to be manufactured in a week for a given variant of automotive. Any research in this area could translate into savings for all the models using similar method of joining. Considering the industry, in general, the findings could help validate the application while ensuring justified use of the high-cost adhesive material. Besides, excessive use of the adhesive may adversely affect the structural strength of the joint. Linear stripes in the horizontal and vertical directions and criss-cross pattern shall be investigated and analyzed for possible effective configuration of the orientation of the stripe. During this research work, the joint shall be ensured to address the criteria of the permissible shear strength for the given adhesive. The parameters - type of adhesive, thickness of the layer and the extreme boundaries covered shall remain constant throughout the research work. The parameter to be varied for this work shall be the geometry (or the configuration of the pattern) of the adhesive layer. The benchmark geometry being a continuous plain layer of uniform thickness extending throughout the inner region upto the boundary of the mating part i.e. the brake shoe liner. The adhesive layer shall be applied over the top surface of the base, typically, a metallic sheet or plate. The bottom face of the liner shall be pasted over this adhesive layer and allowed to cure at room temperature while being clamped in a vice with a pre-determined force for a given time. Mathematical treatment shall be offered in the initial phase of the work. Computational methodology shall form the core of this research work to find alternative solution. The prototype shall be tested using the relevant standards for validation. The best suitable geometry or configuration of the pattern shall be recommended towards conclusion of this work.

4. OBJECTIVES

It is proposed to improve shear strength of adhesive joint application by adding different grooves or by changing texture on pads or by changing the adhesive layer thickness and analyzing it using FEM techniques and validate the result with experimental result.

- Study of literature review in the area of adhesive joints application such as brake pads and methods to be used to analyze the mentioned problems.
- Study of literature review of structural analysis (shear strength) analysis of brake pads considering different surface textures.
- Study the geometry connections of brake pads.
- Study the shear stresses developed in benchmark geometry using CAE softwares.
- To find the best configuration of the pattern and thickness for the adhesive layer to affect maximum permissible Shear Strength of the joint.
- Conduct experimentation for validating results.

- Recommend the best alternative design for optimal pattern or thickness of adhesive layer.

5. SCOPE OF WORK

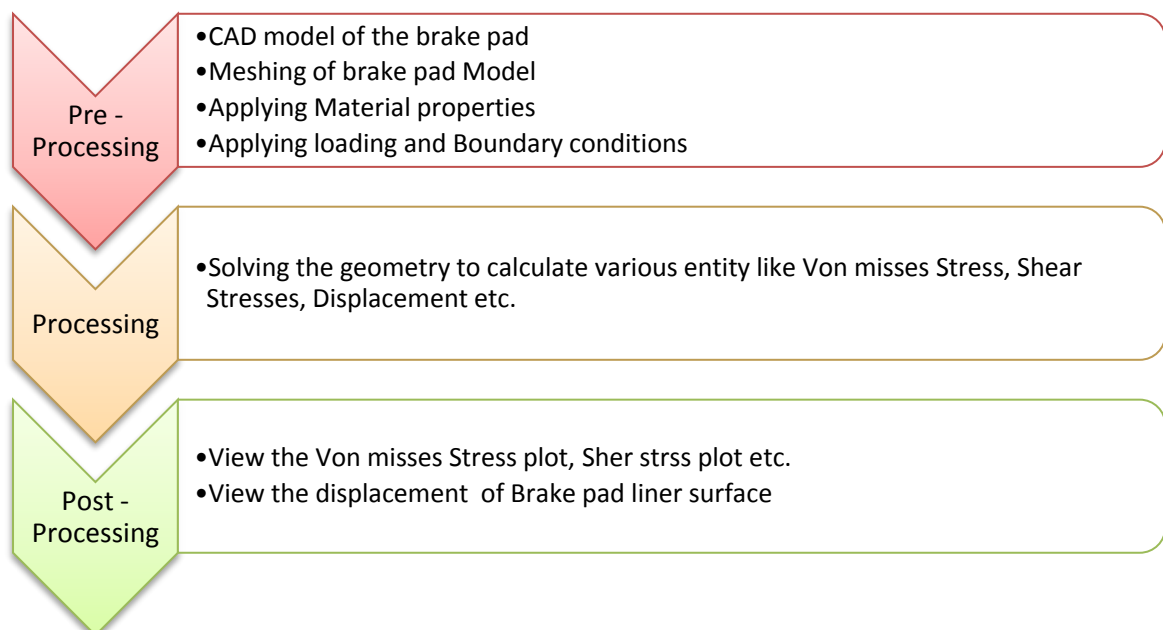
- Analysis for finding the shear strength in adhesive layer by Numerical and Experimental methods.
- Revising the geometry by suitable thicknesses and patterns and finding out the results.
- Identifying the variation in geometry for best configuration of thickness and patterns.
- Finding out the best suitable alternative which gives satisfactory results after geometry changes.
- The results including best surface texture on brake pads or optimum adhesive layer thickness and new geometry variant without affecting the shear strength of adhesive layer.

6. METHODOLOGY

Steps for execution of the work:

- i.) Study the types of Adhesive Joints and effect of surface pattern on response parameter/s.
- ii.) Identify the problem which can effect on performance of disc brake.
- iii.) Study the material and suggest suitable values for design parameter/s
- iv.) Generate 3D model
- v.) Mesh geometry using Hyper Mesh
- vi.) Conduct CAE Analysis
- vii.) Conduct Experimentation
- viii.) Compare the results with the existing part

1st : Computational Method-



2nd : Numerical Method-

Calculate the shear strength of adhesive layer by mathematical calculation for any geometrical variant can be used for analysis and validate the results by Computational and Experimental method.

3rd : Experimental Method-

For Experimental purpose we can use Universal Testing Machine (UTM) machine with the help of fixture, the component shall be test, to find out the stresses developed in localized region of brake shoe. Strain gauge is used for stress determination purpose.



Figure 2: Universal Testing Machine

4. FIXTURE

The shearing test fixture shall have the means to hold a test sample such that it is parallel to the loading tool. This tool shall have a radius of 1.5 mm at the part in contact with the test sample. Drum Brake Shoe Assembly The fixture (see Fig. 2) shall be designed so that the loading tool is in contact with the edge of the lining for the full sample length and thickness within 1 ± 0.2 mm of the shoe platform. Load application on the loading tool shall be in a direction parallel to the plane of the shoe platform. The shoe shall be supported to maintain uniform loading along the length of the lining sample. The width of the loading tool shall be greater than the width, W, of the lining.

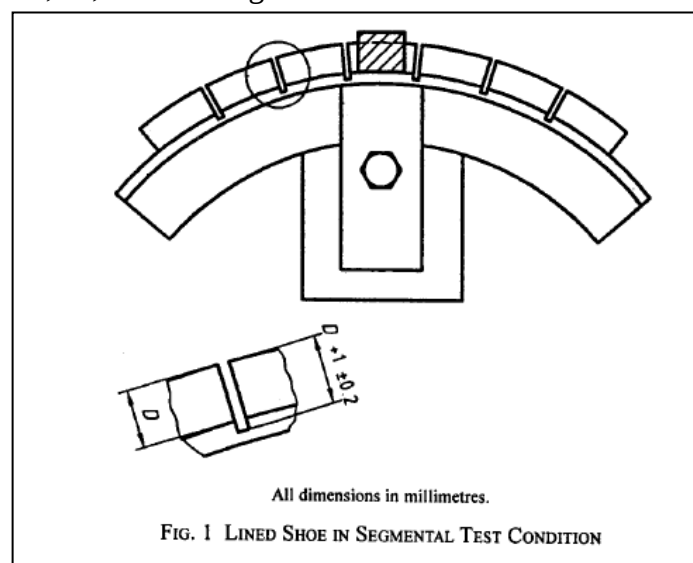


Figure 3: Testing Fixture schematic layout

5. VALIDATION

Validation of the best suitable alternative design of adhesive layer or Surface Texture by comparing the results obtained from Numerical method. Comparison of results of best suitable design variant with reference to benchmark geometry for the affected shear strength due to variation in geometry.

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Fingerprint Based Vehicle Security System

Paper ID	IJIFR/V3/ E12/ 007	Page No.	4486-4494	Research Area	Embedded System
Index Terms	Authentication, Fingerprint, GSM, Sensor, Redundant System				

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Abstract

In today's life use of the vehicle is an important part of life and along with its safety concerns are also very important. To increase the safety of vehicle different type of security systems are available in the market out of which most common are beepers, fire alarm, security camera and personal safety products, but, issue with this is that automobile loaded with all the above facilities comes with high price. To overcome this problem in this work Biometric system is used as security for vehicles. Biometric System is the combination of two different technologies which are Embedded System and Biometric. Biometric is Greek word which means study of life. Biometric is the method for individual identification of humans. Biometrics refers to recognition and verification of retina, Hand shape and size, finger ridge etc. Fingerprint proves one of the best recognition systems. The security system implemented using Arduino mega

1. INTRODUCTION

Individual identification becomes popular because of some important applications like it provides protection to computer systems, cell phones in terms of security. And to get a high level of security is a critical task so there are a number of authentication techniques. Individual identification can be done in three ways. 1st is knowledge based, 2nd is token based and the 3rd one is biometric. In knowledge-based that an individual knows about it for making his identification like password or PIN (personal identification number).

In Token based individual can be identified by license, passport, ID Card, Credit card. But these approaches have demerits because these identification cards may be stolen. And Biometric approach is a physiological aspect so researchers get concentration into a biometric authentication system. It is a modern technique. A number of biometric patterns are in existence which is the face, iris, retina, voice. But none of these biometric proven to be perfectly secure and reliable. The fingerprint reorganization is popular and gifted for unique identification which is more reliable and accepted worldwide. Advantage of finger print based sensor is that it has very low false rejection and acceptance ratio, while former is as low as 0.1% later is at 0.01%.

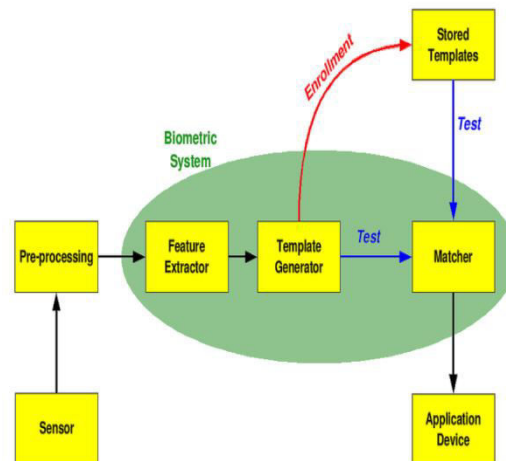


Figure 1: Internal working of biometric module

Three different modules contained in fingerprint reorganization system. These are capturing module to capture images, extraction module to extract features and last but not the least matching module to match the extracted pattern. These modules are represented as:

Fingerprint Module: Fingerprint module has inbuilt ROM, RAM, and DSP. N number of fingerprints can store in this.

Fingerprint Enrolment: While registering a user need to place the finger twice on scanning glass (optical sensor) for better accuracy and to generate and develop exact geometry of finger which will be saved for late purposes.

Fingerprint Matching: After saving data of the user when server will place the finger on optical sensor it will match it from the template stored in the library.

The operation of this module can be done in two modes which are master mode and user mode.

Master Mode- use to register fingerprint and store with a unique id.

User Mode- verifies the scanned image with stored image.

Because of high storage efficiency and secureness algorithm preferred and used is minutiae matching algorithm.

Features of fingerprint identification

Uniqueness Fingerprint of every individual is different from other so false acceptance rate depends on accuracy (quality) of scanner.

Permanence Fingerprint not change with ageing.

Acceptability Fingerprints are easy to obtain as people reflect it everywhere and can be easily obtained.

Circumvention A finger can be cut off. Fingerprint sensor embedded with liveliness detection can undertake this issue and problem can be solved. For identification in high security environment, avoid using fingerprint readers without liveliness detection.

II. PROPOSED WORK

A person has to verify the fingerprint to get access of ignition. 16*2 LCD is added onto system on which we can see the process status of the fingerprint scanner. In terms of security, GSM plays a vital role. GSM (Global System for Mobile Communication) use to send and receive message and voice.

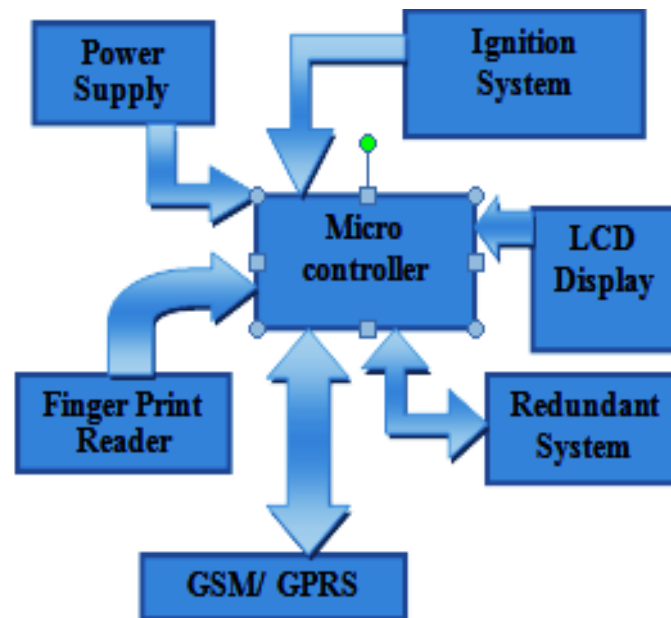


Figure 2::Block Diagram

3. HARDWARE DESCRIPTION

A. Microcontroller ARDUINO MEGA

ATmega2560. The Mega2560 differs from all other boards because it does not use FTDI USB-to serial driver chip. Instead, it uses USB-to-serial converter. The MEGA module provides different inputs and outputs, either analog or digital. Moreover, it also provides features of PWM outputs for speed control and various other features. Arduino Mega is microcontroller board which is based on ATmega 2560. It has 54 digital I/O pins(In which 14 can be used as PWM O/P).

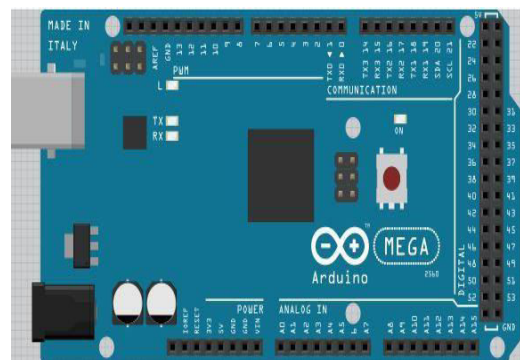


Figure 3: Arduino Board

TABLE I: SPECIFICATION LIST OF ARDUINO MEGA 2560

Microcontroller	AT mega 2560
Operating voltage	5V
Input voltage (approved)	7-12V
Input voltage (range)	6-20V
Digital Pins	54 (14 can be used as PWM output)
Analog Pins	16
DC Current per I/O Pin	40mA
DC Current for 3.3V Pin	50mA
Flash Memory	256KB
EEPROM	4KB
UART	4
Clock Speed	16MHz

B. Fingerprint Scanner

For scanning FIM 3030N has been used. It has inbuilt processing unit and unit for permanent (RAM) and temporary storage(ROM) and N number of fingerprints can be stored. The working will be shown in fig. 4 below.

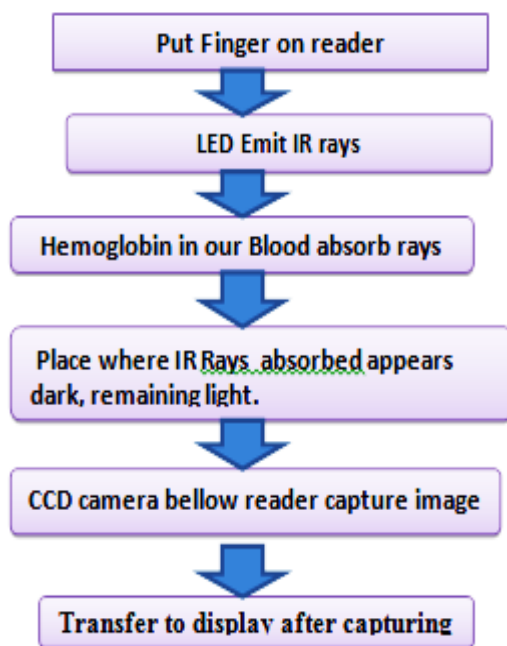


Figure 5: Flow graph of finger print module

C. GSM

SIM900- means module supports communication in 900MHZ band. In India mobile network operates in 900MHZ frequency band. The power requirement of GSM module may be 12v, 15v or 5v. If having 5v module then can power it directly from Arduino's 5v out.

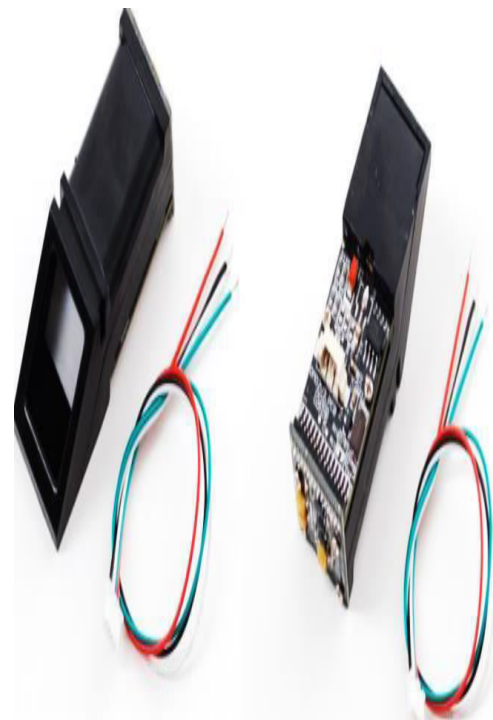


Figure 4: Finger print module

The connection of GSM to Arduino

GSM	Arduino
Tx	Rx
Rx	Tx
GND	GND



Figure 6: Finger print module

4. WORKING OF PROPOSED WORK

A. Access of ignition through fingerprint reader

As the driver start the key system is initialized and SMS of initialization send to owner by GSM LCD display the status of Put the finger on reader. When user put the finger on scanner, LCD display it is authorized access or not. If authorized Ignition get start. If it is unauthorized access, system asks to put the finger again on reader. After attempting three trails of unauthorized access system get locked. And SMS of system locked send to owner.

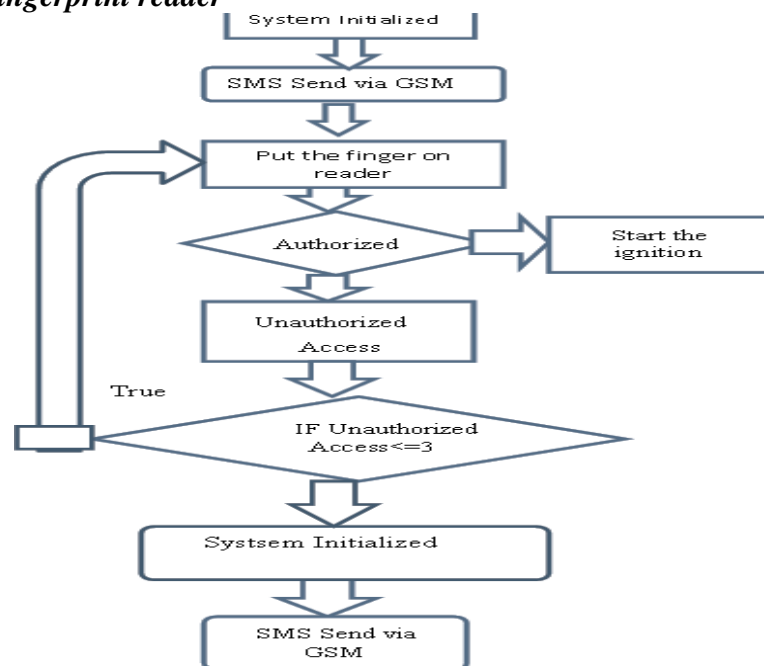


Figure 7: Flow chart of proposed work

B. Access of ignition through redundant system

This project, we also introduce the redundant system. In case of emergency when an unauthorized user wants the access of ignition system he need to request for OTP from the owner through pressing the key of keypad, and if owner wants to give access to that unauthorized person, he will tell received OTP to driver and after entering that password driver get the access of ignition system. Redundant system also used by authorized user if Finger print module fails to work.

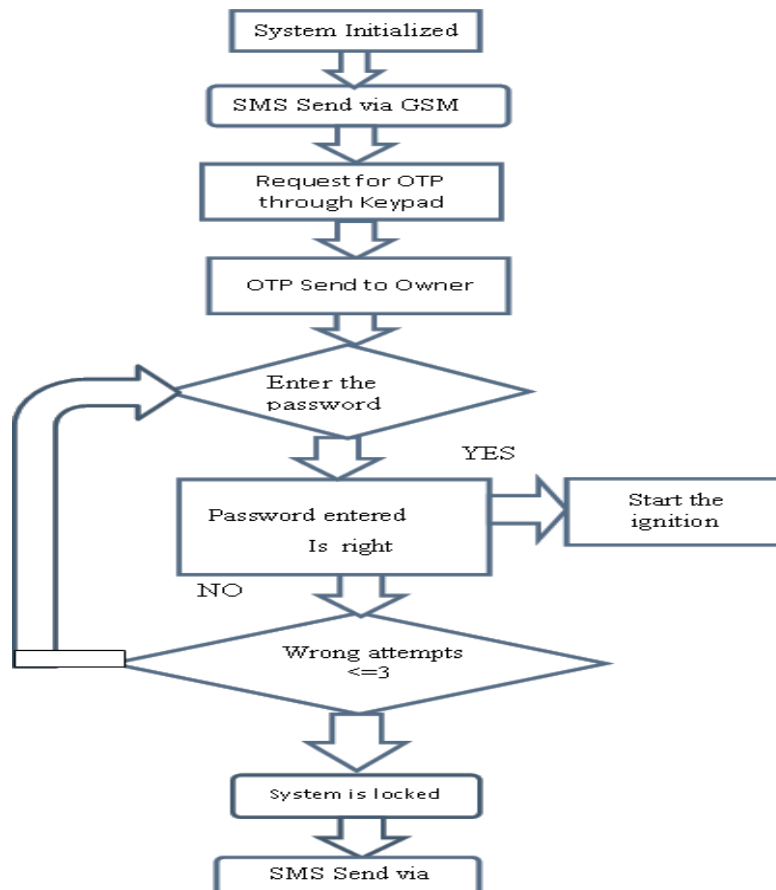


Figure 8: Flow chart of proposed work

5. RESULT

The Basic setup of the prototype system is depicted in Figure.3

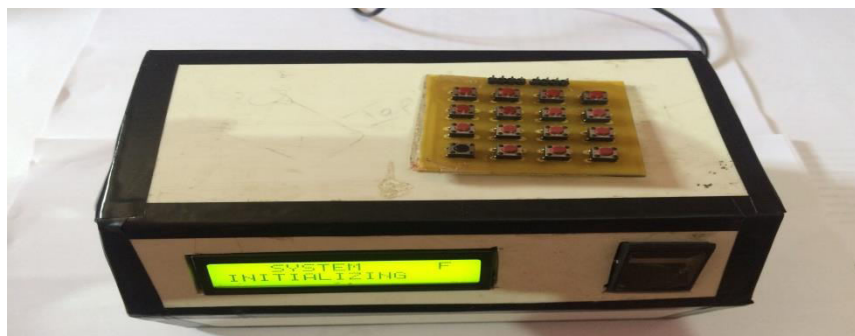


Figure 9: Basic System setup

I. System Initialization

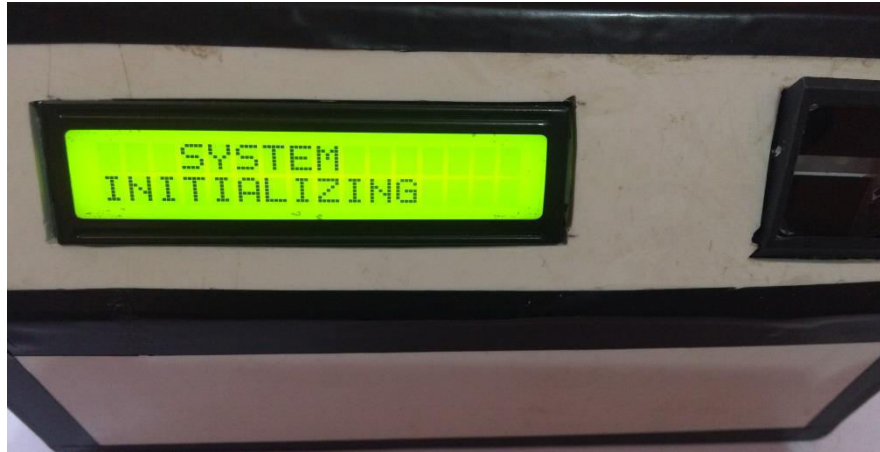


Figure 10: System initializing

II. Fingerprint verification



Figure 11: Finger verification

III. Fingerprint recognition

A. Authorized User

If the fingerprint template is stored in database then user finds the match with stored image by a unique ID.



Figure 12: Finger verified

B. Unauthorized User

If user put the different finger or unauthorized person trying to scan the fingerprint then following message with “Not find same finger” is displaying. And the system displaying the message “Put finger again” After attempting three trails of unauthorized access system gets locked. And SMS is send to owner by GSM.

IV. System locked

If an unauthorized person scans his fingerprint and trying more than three trials then the system gets locked. And SMS send to owner through GSM. LCD displaying the “SMS SENT SYSTEM LOCKED” on screen.



Figure 13: System locked status send via a GSM

V. Acknowledgement through GSM

As the system get initialize, a message of initialization sent to owner through GSM. If unauthorized person trying to get access, owner receive the SMS of unauthorized access, Also OTP sent to owner when unauthorized person request for OTP.

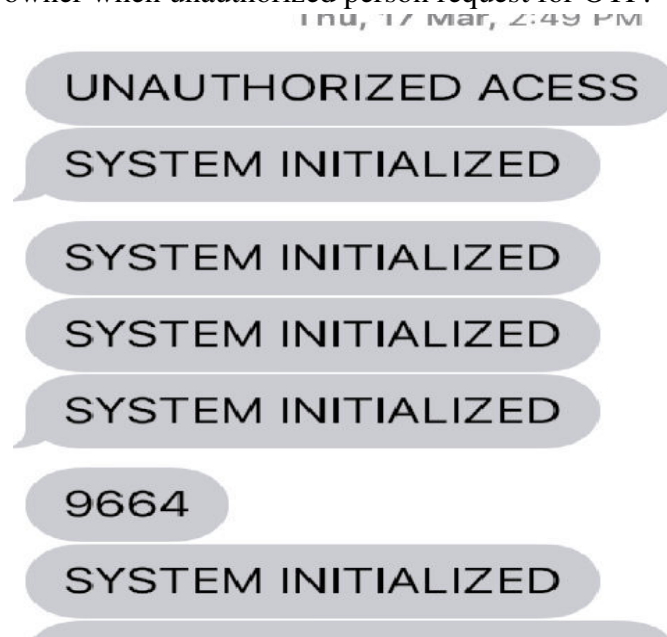


Figure 14: SMS received by owner

VI. Ignition System gets Start

For prototype Relay is used with CPU Fan to replace the ignition system. As the authentication of fingerprint is done ignition get started.



Figure 15: Prototype of Ignition

6. CONCLUSION AND FUTURE SCOPE

The proposed objectives were successfully accomplished in the ideal model developed. Sensors depending on the fingerprint will continue the field of biometric sensors and security applications will enhance with use of it as it is secure more sounding and economical. The developed system ensures that only authorized driver can get access of vehicle and misuse of vehicles by others or un-authorized users can be prevented. The present module also including a GSM module for additional safety so that if un-authorized person trying to access the vehicle, SMS is send automatically to owner and system get locked.

Future Scope

The present module can be extended to including a GPS module for additional safety so that is vehicle is stolen, by GPS module we can track the location of vehicle

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Social Adjustment And Social Maturity As Predictors Of Academic Achievement Among Adolescents

Paper ID	IJIFR/V3/ E12/ 021	Page No.	4495-4507	Subject Area	Education
Index Terms	Social Adjustment, Social Maturity, Academic Achievement, Adolescents				

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Abstract

The present study was conducted to investigate social adjustment and social maturity as predictors of academic achievement among adolescents. Descriptive survey method of research was used for collecting the data using Adjustment Inventory for School Students (AISS) by A. K.P. Sinha and R.P. Singh (1993) and Social Maturity Scale (RSMS) by Nalini Rao (1986). Sample included 200 randomly selected students of 10th class from government high schools of Darbhanga District (Bihar). Descriptive, correlational and inferential statistics were used to compute correlations and to compare the means between the groups. Findings of the study revealed that (1) there is significant relationship between social adjustment, social maturity and academic achievement of students across total and sub samples (2) there is significant difference between boys and girls in respect of their social adjustment and social maturity, however they do not differ significantly on academic achievement (3) there is significant difference between rural and urban students in respect of their social adjustment, social maturity and academic achievement. It is recommended that similar research with appropriate methodology and design may be used to ascertain the degree of conformity which this research has on the above said variables, namely, social adjustment and social maturity. Educational planners and curriculum designers are required to consider a course dealing with social skills and the ways to get adjustment with the problems facing the students in different fields particularly in academics.

1. INTRODUCTION

Adolescents are the most vulnerable section of the society. They experience stress and anxiety which are usually of a much higher gradient. While the degrees of these symptoms may vary between individuals, they seem to be a pervasive part of every adolescent's life. Dogra (2007, p. 4) claims that adolescence is the period between childhood and adulthood. But, finding a precise definition of adolescence is difficult. Adolescence is a culturally rather than a biologically defined phase of development. In general, adolescence begins with the onset of puberty, and ends somewhat indefinitely, with the transition to young adulthood. This passage of adulthood is marked by a number of small changes in status during or near the end of adolescence (Darley, et al., 1988, p.456, 457).

Pascarella and Terenzini (1991) describe this transitional phase as a "culture shock involving significant social and psychological relearning in the face of encounters with new ideas, new teachers and friends with quite varied values and beliefs, new freedoms and opportunities, and new academic, personal and social demands" (pp. 58- 59). The psychologists theorize that individual who is emotionally healthy is the one who has learned to cope effectively with himself and his environment since the environment is in a constant state of flux and the adolescent is continuously developing and changing. If a person's social and personal behavior appears to be reasonably well integrated, he/she appears to be reasonably happy. If the society approves of his/her behavior, his/her means of coping therefore, with himself and his environment may be more effective. Thus he/she may be psychologically healthy or well adjusted (Mickelson, 2001).

The optimal development of children is considered vital to society and so it is important to understand the social, emotional, and educational adjustment of children. Children need a combination of intellectual skills, motivational qualities, and socio-emotional skills to succeed in school. Generally, adjustment refers to an individual's general adaptation to his environment and the demands of life. Adjustment is not a one way process in which the individual conforms to the duties and requirement of others but rather a two way process, for it is the ability to be oneself, hold on to one's own and make reality adapt itself to one's requirement and needs. It does not imply a state or condition of contentment or pure mind. Since life is constantly changing, the ability to revise one's attitude and behavior appropriately is an essential ingredient of adjustment. The basic objective to adjustment is to set a balance between one's wishes and social expectations that affects all aspects of one's life. As a result, the person can respond properly to all environmental stimuli to acquire his favorable stimuli and reinforcement. Dhingra and colleagues (2005) assert that adjustment is a continuous process through which one changes to be in proper adjustment with his environment, others, and himself. Although adjustment contains many aspects like social, emotional, physical and educational dimensions; the best aspect is social adjustment which is the prerequisite to the other aspects of adjustment (Mazaheri, Baghiyan, & Fatehizadeh, 2006). Emotional and social adjustment resulting from positive self-concept can provide the person with some kind of ability to face the difficulties, and higher self-esteem strengthens one's ability to efficiently tackle with the psychological pressures (Wilbum & Smith, 2005).

Social development is one of the major developmental state in which adolescents pass through during their transitional period from childhood to adulthood. The foundation of socialization which is laid during the childhood plays an important role in social maturation, social learning and social adjustment. Encouraging social maturity is positive stimulus as it provides child with an important set of social skills that increases the likelihood that he or she will enjoy a rich, meaningful, and successful life. If the adolescent is unable to behave as his age appropriate in the society he is labeled as socially immature. On the other hand a person who is aware of his roles in the group, desire to keep pace in social life, considerate about the treatment of others, willingness to be a non-conformist etc. may be called as a socially matured person. The social maturity has various aspects of social abilities as self-sufficiency, occupational activities, communication self-direction and social participation. Hence the present study was conducted with the objectives, to know the social adjustment and social maturity level of adolescent students and their effects on academic performance.

2. CONCEPTUAL FRAMEWORK

i. Social Adjustment: Concept and Definitions

The present society is a demanding society where individuals have to adjust with the social values. Quality social relationships and good social skills play a performing role in healthy psychological development, successful academic endeavour and mature social relationship. Social adjustment means a harmonious relationship with the people around and meeting respectively to the social requirements of the home, peer groups, culture and the community. Although adjustment contains many aspects like social, emotional, physical and educational dimensions; the best aspect is social adjustment which is the prerequisite to the other aspects of adjustment (Mazaheri, Baghiyan, & Fatehizadeh, 2006). Emotional and social adjustment resulting from positive self-concept can provide the person with some kind of ability to face the difficulties, and higher self-esteem strengthens one's ability to efficiently tackle with the psychological pressures (Wilbum & Smith, 2005). Slebi and Gorra (1998; Quoted (2005), knew social adjustment as a synonym for social skill, where they believed in social adjustment as the ability to make mutual relationship with other at a special social area which is acceptable concerning the traditions and customs undergoing the community. Jain (2012) defines social adjustment as an effort made by an individual to cope with standards, values and needs of a society in order to be accepted. In the technical language of psychology "getting along with the members of society as best one can" is called social adjustment. Hence, adjustment with oneself and the surrounding environment is critical to anyone, that the most effort by the man is centered at the adjustment which enjoys a huge importance that its inefficiency with the feeling of self-worthiness has been in low extent (Goodwin et al., 2008).

ii. Social Maturity: Concept and Definitions

Maturity implies developing one's physical and mental abilities to the fullest extent. It requires adjusting to and participating in one's environment creatively in order to reach the

stage of functional readiness. Social maturity is the ability to function in an appropriate responsible manner and understanding of the social rules and norms in place in a given culture and the ability to use that knowledge effectively. It is the age appropriate behaviour that conforms to the standard and expectations of the society. Social maturity creates trust, harmony, active co-operation and peaceful co-existence at one hand while social immaturity creates fear, discord, confrontation and quarrel at another hand (Nagra& Kaur, 2013). The social maturity has various aspects of social abilities as self-sufficiency, occupational activities, communication self-direction and social participation (Athanimath, 2009). The social maturity as a term is used commonly in two ways. Firstly, in reference to the behavior that conforms to the standards and expectations of the adults and secondly in reference to the behavior that is appropriate to the age of the individual under observation (Srivastava, 1987). Social responsibility, also a sub-trait of social maturity, defined as adherence to social rules and role expectations, by Wentzel (1991) is instrumental in the acquisition of academic knowledge and skills. Social performance, sociable and pre social behaviour, social inhibition and withdrawal are some of the traits associated with the psychosocial maturity of an individual. Raj defines social maturity as the level of social skills and awareness that an individual has achieved relative to particular norms related to an age group. It is a measure of the development competence of an individual with regard to interpersonal relations, behaviour appropriateness, social problem solving and judgment. They are either the components or the resultants of social maturity. In the present study social maturity refers to score obtained on scale by Dr. R.P. Shrivastava, 1998.

iii. Academic Achievement: Concept and Definitions

Academic achievement occupies a very important place in education as well as in the learning process. It is influenced partly by the individual's ability to adjust to his environment, partly by his special abilities, intelligence and aptitude which are an integral part of his personality and partly by the intensity of drives and motives which serve as the impelling force for his activities. Academic achievement, according to Good (1955), is defined as "knowledge attained or skills developed in the school subjects, usually designed by test scores or by marks assigned by teachers, or by both". Trow (1956) defined academic achievement as "knowledge attaining ability or degree of competence in school tasks usually measured by standardized tests and expressed in a grade or units based on pupils' performance". Thus, academic achievement refers to the degree of level of success and that of proficiency attained in some specific area concerning scholastic and academic work. In the present study academic achievement refers to the aggregate marks obtained by the secondary school students in their annual examination.

3. REVIEW OF RELATED LITERATURE

Muni & Pavigrahi (1997) found that girls are better adjusted in social adjustment as compared to boys. Enochs and Roland (2006) studied male and female university students in the first year, where he studied the nature of the environment, gender and the relation

with level adjustment of social in the university, the result indicate out that males are more adjusted than females. Lama (2010) reported that male students are better adjusted in overall adjustment. Roy, Ekka and Ara (2011) observed that Girl students were better adjusted in all areas of adjustment than Boy students. Yengimolki, et al. (2015) in a study of Persian students found no difference in social adjustment of male and female students.

Kurvilla (2006) reported that urban were well adjusted than rural students in all areas of adjustment problems. Thakkar (2003) studied academic achievement, adjustment and study habits of rural and urban students and found that rural boys were slightly better adjusted in comparison to the urban students in the area of social adjustment.

Diwan (1998) conducted a study to find the effect of socio-economic status on the social maturity of higher secondary students. He found that i) the students belonging to urban area and rural area are found equal on the scores of social maturity; ii) the students of both sexes are just the same on social maturity scores. Rani Swarupa and C.R. Prabha (2008) in their study conducted on a sample of 180 adolescents comprised of equal number of boys and girls found that majority of the girls were more socially mature than boys. Kalyandevi, T. and C. Prathima (2008) conducted a study over a sample of 240 adolescents studying 8th, 9th and 10th standards. The results reported no grade and gender differences in the social maturity of adolescents. Singh et al.(2013) studied on gender on social and emotional maturity of senior school adolescents. The study revealed that girls scored significantly higher on the social adequacy component of social maturity. However, no gender differences were observed on the composite social maturity and emotional maturity scores. Social maturity was found to be significantly positively correlated under both genders. Since no conclusive result is observed from the study of the review of related literature on the selected variables therefore, it is necessary to carry out further research to confirm the effect of interaction of social adjustment and social maturity on academic achievement of adolescents.

4. RATIONALE OF THE STUDY

Adolescence is a phase where many psychological factors dominantly mediate an adolescence sense of wellbeing which ends up shaping / having a long range impact on the individual. Therefore an understanding of psychological predictors of some of the components of well-being can provide a framework for developing more effective interventions to cushion the components of wellness. Social maturity and social adjustment play a major role in a personal and social life of an individual. Socially adjusted and mature person uses his potential intelligently in the pursuit of goals without deviation. According to the research conducted by Indian Paediatrics Association in 2002 about the social maturity of the children, it was found that any kids embrace the entrance into the fascinating cultural and social that set them apart from adults. A high degree of social maturity demands the development of social skills, psychomotor skills and social development. Without it, we end up having a difficult time ourselves, or causing a lot of difficult times for other people. The findings from the study may assist the government to minimize wastage on human resources

and assist the parents who invest heavily in education in that, their resources are not wasted when the students are well adjusted at the schools. It is of essence to mention that, the students will enormously benefit from this study by understanding the determinants of their levels of social and academic adjustment. Hence the students may be able to do well in academics and emerge as well adjusted citizens and personnel for job markets.

5. OBJECTIVES

In the light of the review of the literatures, the present investigation was conducted with the following objectives:

- i.) To study the relationship between social adjustment, social maturity and academic achievement of students.
- ii.) To compare boys and girls (both rural and urban) on the measure of social adjustment, social maturity and academic achievement.

6. HYPOTHESES

Based on the review of literature and aforementioned objective the present study formulated the following hypotheses:

- **H₁:** There is no significant relationship between social adjustment and academic achievement of students.
- **H₂:** There is no significant relationship between social maturity and academic achievement of students.
- **H₃:** There is no significant difference between boys and girls in respect of their social adjustment.
- **H₄:** There is no significant difference between boys and girls in respect of their social maturity.
- **H₅:** There is no significant difference between boys and girls in respect of their academic achievement.
- **H₆:** There is no significant difference between rural and urban students in respect of their social adjustment.
- **H₇:** There is no significant difference between rural and urban students in respect of their social maturity.
- **H₈:** There is no significant difference between rural and urban students in respect of their academic achievement.

7. METHODOLOGY

This study utilized survey techniques due to its descriptive nature. This section is comprised of sample, research tool and procedure of the data collection.

I. Sample

The present study was conducted on a representative sample of 200 10th class students randomly selected from Govt. Schools of Darbhanga District. The government high schools

were selected for the sake of similarity in the infrastructures. The ages of the students ranged from 15 to 17 years with an average age of 16 + years.

II. TOOLS USED

The researcher used the following tools for collecting the data to study the research in hand.

a. Adjustment Inventory for School Students (AISS) by A. K.P. Sinha and R.P. Singh (1993)

The inventory consists of 60 items, 20 items for each area of adjustment i.e. 20 items measure Emotional Adjustment, 20 items measure Social Adjustment and 20 items measure Educational Adjustment. Each item in the inventory has two answers 'Yes' or 'No'. For any answer indicative of good adjustment, zero is given; otherwise a score of one is awarded. The split half reliability is 0.95, the test retest reliability is 0.93 and the K-R formula reliability was found to be 0.94. Validity coefficients were determined for each item by the biserial correlation method significant level being .001.

b. Social Maturity Scale (RSMS) by Nalini Rao (1986)

Social Maturity Scale is a 90 items scale which can be administered to the respondents in groups in the regular class-room situation following the instructions given in the manual. The scale consists of three components viz., personal adequacy (work orientation, self-direction and ability to take stress), interpersonal adequacy (communication, enlightened trust and cooperation) and social adequacy (social commitment, social tolerance and openness to change). It is a four point scale: Strongly Agree, Agree, Disagree and Strongly Disagree with respective scores 4,3,2,1. The reliability of the sub scales ranges from 0.91 to 0.63. The test- retest reliability of the scale is found to be 0.79 and has been validated against the external criterion.

III. Academic Achievement

Aggregate marks secured by students in the annual examination of class 10th were taken as the academic achievement of the students. These marks were collected from the office records of the concerned schools and used in the analyses of the data.

IV. Procedure Of Data Collection

The researcher collected the data personally with prior permission of the schools and concerned teachers. The administration of the tools viz., Adjustment Inventory for School Students (AISS) by A. K.P. Sinha and R.P. Singh (1993) and Social Maturity Scale by Nalini Rao (1986) were completed following the instructions given by the respective authors.

V. Statistical analyses of the data

Keeping in view the objectives as well as design of the study, coefficient of correlation and 't' test were used for the analysis of the data. Pearson's Coefficient of Correlation was computed to analyze the relationships. Mean, Standard Deviation and 't' test were used to find the significance of difference between the means.

8. RESULTS AND DISCUSSION

I. Correlation of Social Adjustment, Social Maturity and Academic Achievement.

The study was conducted to ascertain the extent of relationship between dependent variable (Academic Achievement) and independent variables (Academic Stress and Test Anxiety) using Pearson's' Product Moment Coefficient of correlation. Results of the correlation are presented in Table No.1

Hypothesis: 1 (H_1): There is no significant relationship between social adjustment and Academic achievement of students.

Hypothesis: 2 (H_2): There is no significant relationship between social maturity and academic achievement of students.

Table 1: Correlation Coefficients of Social Adjustment, Social Maturity and Academic Achievement

Variables	Coefficients of Correlation				
	Total (200)	Boys (100)	Girls (100)	Rural (100)	Urban (100)
Social Adjustment and Academic Achievement	- 0.254 (.05)	-0.293 (.05)	-0.315 (.05)	-0.275 (.05)	-0.333 (.01)
Social Maturity and Academic Achievement	.291 (.05)	0.301 (.05)	0.359 (.01)	0.269 (.01)	0.327 (.01)

Perusal of table-1 establishes that there is a significant but inverse relationship between academic achievement and students' social adjustment for total sample, boys & girls and rural and urban students. It means that the higher the students' social adjustment, the better and more desirable academic achievement they would have and vice-versa. The reason for students' higher social adjustment resulting into better academic achievement may be due to students using their social abilities and skills in right perspectives getting social acceptance and it, in turn, leads to successful social adjustment. The students who have lower social, emotional and educational adjustment, face various interpersonal problems (Wiener, 2004) and the problems like losing motivation, frustration, anxiety and depression (Sideridis, 2006), these problem, in turn, result in causing failure in academic achievement of the students. This result is in consonance with the findings of Nasir & Lin, (2012) and Ray & Elliott, (2006). Thus the hypothesis H_1 is rejected and it is reframed as **there is significant relationship between social adjustment and academic achievement of students**. The significant positive relationship (table -1) between social maturity and academic achievement for total sample, boys & girls and rural and urban students signify that student's social competence and interpersonal acceptance may constitute emotional and social resources for achievement in the school (Wentzel, 1991; Wentzel and Asher, 1995). In general, it has been found that children who display sociable and prosocial behavior are likely to achieve highly in academic areas (Green et al., 1980; Masten et al., 1995; Wentzel

and Asher, 1995). Such result is also reported by A.S. Arul Lawrence and Rev. Dr. I. Jesudoss (2011). Thus the hypothesis H_2 is rejected and it is reframed as **there is significant relationship between social maturity and academic achievement of students.**

II. Comparison of boys & girls on the selected variables

The comparison of the samples on the selected variables was done by testing the significance of difference between their means by using t-tests. The results are presented in the following tables.

Hypothesis: 3 (H_3) : There is no significant difference between boys and girls in respect of their social adjustment.

Hypothesis: 4 (H_4) : There is no significant difference between boys and girls in respect of their social maturity.

Hypothesis: 5 (H_5) : There is no significant difference between boys and girls in respect of their academic achievement.

Table No.2: Comparison of Boys and Girls on the Selected Variables

Variables	Gender				t - value
	Boys (100)		Girls (100)		
	M ₁	σ ₁	M ₂	σ ₂	
Social Adjustment	7.73	3.01	6.16	2.84	3.81 (.01)
Social Maturity	238.6	11.29	242.13	12.57	2.10 (.05)
Academic Achievement	350.21	61.22	358.17	60.70	1.30 (N.S.)

Table-2 presents mean scores of boys and girls for social adjustment, social maturity and academic achievement. The significance of difference between means varies between .05 to .01 level of significance for boys and girls on the said variables. Perusal of table-2 reveals significant difference between mean scores of boys and girls favouring girls on the variable, social adjustment. It means that girl students are more socially adjusted than the boys. The girls being more sociable may be due their positive self-concept which may provide them some kind of abilities to face the difficulties, and higher self- esteem strengthens their ability to efficiently tackle with the psychological pressures. This, in turn, may leads to success in better social adjustment. Similar findings were reported by Muni & Pavigrahi (1997) and Roy, Ekka and Ara (2011). Thus the hypothesis H_3 is rejected and it is reframed as **there is significant difference between boys and girls in respect of their social adjustment.**

Further, in case of social maturity, the calculated 't' value is found to be 2.10 which is significant at .05 level of significance. This means that there exists a significant difference between social maturity of boys and girls favouring the later. Girls displaying significantly

better social maturity may be due to possession of intellectual skills, motivational qualities, and socio-emotional skills which help them to succeed in social institutions. This may help them to understand the feelings of others, control their own feelings and behaviors, and get along with their peers and teachers. These characteristics might have contributed to the girls to be more socially matured. This finding is in line with the findings of Rani Swarupa and C.R. Prabha (2008) and Puranik, S.D. (1984). Thus the hypothesis H₄ is rejected and it is reframed as **there is significant difference between boys and girls in respect of their social maturity.**

Non-significant result in case of boys and girls on the measure of academic achievement may be due to the changing cultural scenario and providing equal opportunities to both boys and girls. This naturally enhances the level of aspirations which ultimately increases the academic and competitive spirit equally. This result is in consonance with studies of Kaur and Gill (1993) and Joshi (2000). Thus the hypothesis H₅ is confirmed.

III. Comparison of rural & urban on the selected variables

The comparison of the samples on the selected variables was done by testing the significance of difference between their means by using t-tests. The results are presented in the following tables.

Hypothesis (H₆): There is no significant difference between rural and urban students in respect of their social adjustment.

Hypothesis (H₇): There is no significant difference between rural and urban students in respect of their social maturity.

Hypothesis (H₈): There is no significant difference between rural and urban students in respect of their academic achievement.

Table No.3: Comparison of Rural and Urban on the Selected Variables

Variables	Locale				t - value
	Rural (100)		Urban (100)		
	M ₁	σ ₁	M ₂	σ ₂	
Social Adjustment	8.23	2.61	7.05	2.35	3.37 (.01)
Social Maturity	239.22	11.78	243.51	12.15	2.53 (.01)
Academic Achievement	370.12	61.05	382.75	59.82	2.09 (.05)

The result in Table-3 depicts that the calculated 't' value is significant at .01 level of significance favouring urban students on the measure of social adjustment. The urban students being more socially adjusted may be due to development of foundational competencies viz, managing impulses and behaving appropriately, communicating effectively, working well with others and resolving conflict. This result is in the conformity

with the finding of Sulthana et.al. (1981) and Kurvilla (2006). Thus the hypothesis H_6 is rejected and it is reframed as **there is significant difference between rural and urban students in respect of their social adjustment.**

Further, in case of social maturity, the calculated 't' value is found to be 2.53 which is significant at .01 level of significance. This means that there exists a significant difference between social maturity of rural and urban students favouring the later. The high social maturity of urban student may be due the fact that in urban setting, environment is calm and congenial which enhances the feeling of social efficiency, personal adequacy, interpersonal relationships, etc. in comparison to rural settings. The schools and colleges situated in urban areas offer more extracurricular activities that enhances their social maturity and the student belonging to these areas are more socially mature than rural ones (McCracken & Barcinas 1991). All these factors make difference in social maturity of student of urban-rural areas. This finding is in agreement with the findings of Vora (1980) and Nagra and Kaur (2013). Thus the hypothesis H_7 is rejected and it is reframed as **there is significant difference between rural and urban students in respect of their social maturity.**

The significant difference at 5% level favouring urban students on the measure of academic achievement may be attributed to their better quality of education and availability of facilities, opportunities and exposure to test their intellect and utilize their talents which help them in better academic accomplishment. The rural students, on the other hand, have the vulnerable aspiration level due to isolation and geographical and cultural context of their community (Haller & Virkler, 1993). This finding is in agreement with the findings of Waqas Rafiq et al. (2013) and Johnson (1998). Thus the hypothesis H_8 is rejected and it is reframed as **there is significant difference between rural and urban students in respect of their academic achievement.**

9. CONCLUSION

Findings from the study on the emotional, social and educational adjustment reveal the rising levels of boys and girls reporting adjustment problems. There are no observed significant differences however between the means of the two groups at the 95% confidence interval. Positive correlation between all three domains within the two groups is observed since, unstable emotions causes disruption in social skills and lack of socialization affects educational achievements. Interviews with children held after the debriefing session revealed that there were significant factors such as limited time with parents, sibling comparisons, parental demands, lack of recreation and stressors at school that contributed to the findings. This draws us to an important implication, as these are findings in a normal school population. There can be severe problems that may evolve, if the condition goes unnoticed. Counseling and the continued assistance of practitioners is seen as vital in providing adequate coping skills and are therefore necessary in resolving these early predictors of distress in mid adolescence transitioning.

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Cellular Effects Of Mobile Radiations On Honey Bees

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Abstract

Apis mellifera , a honey bee species is of great commercial value and contribute to human agricultural food production. There is tremendous increase in mobile phone usage. They produce harmful electromagnetic radiations. In different states of India, there are reports on the drastic decline in the honey bee populations. Mobile phone radiations may contribute in making these species endangered In this paper, the works of different authors in relation to the effect of mobile radiation at different crucial biological processes of honey bees are discussed.

1. INTRODUCTION

Cell phone usage is a major public health concern because of potential risk of chronic exposure to low level of radiofrequency and microwave radiation that pulse off the phone antennae in close proximity to the head. These concerns have induced a large body of research, both epidemiological and experimental, in humans and animals. Honeybees are reliable indicators of environmental status and possess several important ecological, ethological, and morphological characteristics. In the present day situations the usage of the mobile phones and other electronic gadgets has been increasing enormously. The mobile phone radiations are the major cause of the electro pollution in the environment. The electromagnetic radiation (EMR) emitted from the cell phones is very harmful on human beings, plants, animals, micro-organisms in whole ecosystem. It is well known that the population of house sparrow has fallen down because of this reason. Same way the

honey bees populations are also affected because of the EMR. There are various reasons for the decline of the honey bee populations, the effects of EMR can also be added into the list. Many researches were conducted to suggest that cell phone radiations are affecting honey bees very badly and have revealed that there is direct relationship between decline in honey bee populations and electromagnetic radiations (Dalio, 2015).

2. BIOLOGY OF APIS MELLIFERA

- Kingdom: Animalia
- Phylum: Arthropoda
- Class: Insecta
- Order: Hymenoptera
- Family: Apidae
- Genus: *Apis*
- Species: *mellifera*

Apis mellifera is commonly called as common honey bee or European honey bee. Body is golden brown and black, with pale orange/ yellow rings on abdomen. The head, antennae and legs are almost black, fine hairs cover the thorax and only lightly cover the abdomen. Wings are translucent (Arthur *et. al.*, 2003). *Apis mellifera* is about 1.2cm (about 0.5 inch) long, the head and thorax, or midsection, are somewhat bristly and vary in color according to the strain. Two large compound eyes and three simple eyes, or ocelli, are located on top of the head. Keen eyesight is complemented by two sensitive, odor-detecting antennae (Encyclopaedia Britannica)

- **Colony**

A colony of honey bees consist of a queen, several thousand workers, and, in certain seasons, a few hundred drones. A queen can lay as many as 2,000 eggs in a single day. In her four to five years she produces about two million eggs. More than 80,000 bees can live in a single colony (Arthur *et. al.*, 2003).

- **Queen**

Queens are the primary reproducers of the nest and all the activities of the colony are centered around their reproductive behaviors and their survival. The queen is the only fertile female in the colony. She lays eggs nearly continuously throughout the year, sometimes pausing in late fall in cold climates (Hammond and Madison, 2009).

- **Worker bee**

Worker honey bees are infertile females, when some subspecies are stressed they may lay fertile eggs. Workers are essential for social structure and proper colony functioning. They carry out the main tasks of the colony, because the queen is occupied with only reproducing (Wikipedia, 2016). They are the smallest in physical size of the three castes and their bodies are specialized for pollen and nectar collection. Both hind legs of a worker honey bee have a **corbicula** specially designed to carry large quantities of pollen back to the colony (Ashley *et. al.*, 2013).

- **Drones**

Drones are the male caste of honey bees. The drone's head and thorax are larger than those of the female castes, and their large eyes appear more fly-like, touching in the top centre of the head. Their abdomen is thick and blunt at the end, appearing bullet-shaped rather than pointy end as with the female castes (Ashley *et. al.*, 2013). Drone honey bees do not forage for nectar or pollen. Drones will mate with a given queen in flight; each will die immediately after mating, since the process of insemination requires a lethally convulsive effort (Wikipedia, 2016).

- **Life cycle:**

The life cycle of the *Apis mellifera* consists of 4 stages, egg, larva, pupa and adult.

- **Egg**

Honey bee eggs measure 1 to 1.5 mm long and look like a tiny grain of rice. The queen lays eggs in individual hexagonal wax cells in the brood area of the comb (Ashley *et. al.*, 2013). Queen fertilizes each egg (with stored sperm from the spermatheca) as it is laid in a worker-sized cell. Eggs laid in drone-sized (larger) cells are left unfertilized; these unfertilized eggs, with half as many genes as queen or worker eggs, develop into drones (Wikipedia, 2016).

- **Larva**

In the honey bee colony, larvae are referred to as open brood because the cells are uncapped. The number of days a honey bee spends as larvae varies by caste (worker: 6 days, drone: 6.5 days, queen: 5.5 days). Larvae are white and lie in a curled —C shape at the bottom of their wax cell. When the mature larvae are ready to moult into pupae they extend their bodies into an upright position in the cell, and adult workers tending to the brood cover the pre-pupal larvae with a wax capping (Ashley *et. al.*, 2013).

- **Pupa**

Beneath the wax capping, pre-pupal honey bee larvae moult into pupae. The pupae remain under the wax capping until they moult into an adult and chew their way out of the cell.

Similar to the larval stage, pupal developmental time varies by caste (worker: 12 days, drone: 14.5 days, queen: 8 days) (Ashley *et. al.*, 2013). The larvae and pupae in a frame of honeycomb are known as "frames of brood", and are sold (with adhering bees) to start new beehives (Wikipedia, 2016).

- **Adult**

Adult honey bees are covered in branched hairs and can be divided into three body regions: head, thorax, and abdomen. The primary features of the head are the compound eyes and antennae. The most notable external feature of the abdomen is the stinger. Only female honey bees have a stinger, as it originates from a modified ovipositor (Ashley *et. al.*, 2013).

Apis mellifera is of great commercial value as a producer of honey that is used extensively as food and in the manufacture of many products. Bee wax is used in making candles, sealing wax, polishes, certain types of ink, models of various kinds, and

in other products such as face and hand creams, lipsticks and lip salves (Arthur *et. al.*, 2003).

3. EFFECTS OF RADIATIONS

Honey bees are complex unsocial insects that provide a critical contribution to human agricultural food production (Parker *et. al.*, 2010). Recently a new phenomenon of sudden disappearance of bees with little sign of disease or infection has been reported from world. Bees simply leave the hives and fail to return. This is called as colony collapse disorder (CCD) (Sharma and Neelima, 2009). This may be due to habitat loss, lack of hygiene in the hive, climatic factor, pesticide poisoning, viruses, and other pests and diseases. But recent investigation reveals that radiations of different kinds are affecting the population of insects and other organisms. In recent years the growing awareness of the ecological dangers and functional limitations of chemical pesticides has provided an incentive to investigate thoroughly the possible role of radiation mechanisms in chemoreception and temperature measurement in the insect world (Diesendorf *et. al.*, 1974). Insects are generally more resistant to the effects of ionizing radiation than are mammals; the LD50 ranging from 10 to 300 kR in adult insects compared to a range of 0.5 to 1 kR for adult mammals (Richardson and Myser, 1973). Mobile radiations also have great impact on the decreasing population of these species.

Cell phone technology has revolutionized the telecommunication scenario in India. Due to its several advantages, cell phone technology has grown exponentially in the last decade. The numbers of cell phones and cell towers are increasing without giving due respect to its disadvantages (Girish, 2010). Mobile phone uses EMR in the microwave range (450-2100 MHz). In 2011, International Agency for Research on Cancer (IARC) classified mobile phone radiations on Group 2B- possibly carcinogenic (Wikipedia, 2016). Recently, a sharp decline has also been noticed in commercial bee population in Kerala posing a serious threat to honey bees, hitting apiculture (the cultivation of bees on a commercial scale for the production of honey). The State has the highest density of mobile towers. Similar cases have been observed in Bihar, Punjab, Nepal and other parts of India and have been attributed to increasing electro pollution in the environment (Girish, 2010). When honey bee colonies were exposed with radiation, the honeycomb weight and area were reduced and returning time of honey bees increased compared to similar non-exposed colonies (Girish, 2010). The massive amount of radiation produced by mobile phones and towers is frying the navigational skills of honey bees and preventing them from returning back to their hives (Sahib, 2011). The radiations lead to low egg laying capacity in queens (Greenberg *et. al.*, 1981) or exposure of queen bees to cell phone radiation stimulates to produce only drones (Brandes and Frish, 1986). EMFs from telecommunication infrastructure interfere with bees biological clocks that enable them to compensate properly for the sun's movements, as a result of which, may fly in the wrong direction when attempting to return to the hive (Rubin *et. al.*, 2006). Favre (2010) justifies that honey bees are sensitive to pulsed electromagnetic fields generated by the mobile telephones and under these circumstances, observable changes in

the behaviour of the bees are not artificial, but can be proven to occur reproducibly. According to Nashaat *et al.*, 2010, the radiations generated by mobile phones are disturbing the life cycle of honeybees and affecting their reproduction system and honey producing.

4. DISCUSSION

Honey bee are one of the most important insects in our ecosystem, the decreasing population of these insects is a serious concern. One of the major causes Colony Collapse Disorder is due to increased mobile radiations. Both mobile towers and mobile phones emit radiations which impart adverse effects on the behaviour of the *Apis mellifera*, and its colony. Studies conducted by Nashaat *et al.*, in 2013 reveals that the honey bees in their normal state produced sounds at lower frequencies around 450 Hz, and with lower intensity of normalized amplitude. But, when they were disturbed by mobile phones, they produced sounds with higher frequencies that reached 1.5 KHz and with higher intensity reaching 0.7

Normalized amplitude and this may be the reason behind their decline. Exposed high voltage transmission line is leading to low egg laying capacity (100/day) compared to normal (Sahib, 2011) and makes a better explanation of Colony Collapse Disorder (CCD). The honey storing capacity also declined due to loss of returning bees, at the end of experiment there was neither honey, nor pollen or brood nor bees in the colony (Sharma and Neelima, 2010). According to the study conducted by Dalio (2015) revealed that the effects of electromagnetic radiations on *Apis mellifera* colonies caused disturbance and more aggressiveness.

Mobile radiations adversely impacting other organisms also in the ecosystem, due to the exposure of the mobile radiations on cows and calves, it was noted that 32% of the calves developed nuclear cataracts, similar studies on the rabbits showed lens opacities (Sivani and Sudarshanam, 2012). The impact on human beings is much adverse which leads to brain cancer and other cancer incidences when exposed for long term.

5. CONCLUSION

Apis mellifera, a common honey bee is responsible for the 80% of the pollination among field crops and other flowering plants. Beekeeping is one of the oldest traditions in India, honey and bee products have great market demand. It makes the major income for most of our famers. The declining population of these species is a serious issue. The present review clears that the Colony Collapse Disorder (CCD) is mainly due to electro-pollution by increasing mobile phone tower radiations. Most of the countries have restricted the use of mobile phones, but there are no such implementations in India. The mobile phones have great benefits in spite of all the harmful effect and hence complete ban on their usage is not acceptable. But its usage has to be minimized in order to conserve the honey bees. Albert Einstein has stated that man cannot live for more than four years if honey bees are extinct. Electro-pollution has to be taken into consideration with the other environmental pollutions as well.

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Status Of Elementary Education In East Siang District Of Arunachal Pradesh

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Abstract

Arunachal Pradesh being late starter in the field of education, always remained in the bottom of the list in comparison to the other states of the nation in terms of literacy rate. It was in the year 1918 the first ventured school was established in East Siang district of Arunachal Pradesh. This makes this particular district quite distinct in comparison to the other district of the state in terms of educational development. Being late starter it is very difficult for the authority to fulfilled all the criteria of the quality education to all the elementary schools of the state. The elementary schools of the state are facing lots of problems for its qualitative as well as quantitative development instead of various efforts made by the authority to overcome these problems. In case of East Siang district numbers of elementary schools are increasing, GER and NER are quite attractive but at the same time there are many untrained in-service teachers serving in the district at elementary level of schools which is a matter of grave concern. The State Government is trying to clear these backlogs of untrained teachers by providing in-service teacher training on deputation basis. Therefore, this paper examines the present status of elementary education with special reference to the growth rate of schools, enrolment of students, teachers' status and academic performance etc. in order to study the status of elementary education in the district.

1. INTRODUCTION

The East Siang District is a wild mountainous area and presents a remarkable topographical variety. The district has an area of 4005sqkm and is laying approximately between 27°42' and 29°20' North Latitudes and 94°92' and 95°35' East Latitude. The district HQ Pasighat is the oldest town in Arunachal Pradesh and recently it has completed 100 years of its establishment. With its HQ at Pasighat, East Siang district is bounded by Upper Siang

district in north, Dibang Valley district in the east, Dhemaji District of the Assam in the south, and West Siang District in the west. The altitudes of the East Siang District vary from 130mtrs to 752mtrs, the mighty Siang river flows through central part of the district. Out of total population 45265 are male and 42131 are females. The sex ratio is 937 females per 100 males, and the density of population is 22 persons per sq.km.

The district has a varied topography with forest area of 60% it has a profound influence on the climate of region, which varies according to elevation and locations. Both mountain type and tropical climate are experienced in the district. The average rainfall as per meteorological department is recorded 400mm-468mm.

Transport and Communication system are not quite satisfactory and Government's efforts are going on towards development. Transport and communication system of the East Siang district is not very developed in the national contest. But it is good enough in Arunachal Pradesh circumstances. During the last decade a number of new roads have come up in between the villages and in between villages and Pasighat town. In the district there is some developed road communication facilities to which daily bus services ply from Pasighat to different places like Yingkong, Boleng, Pangin, Along, Likabali and Itanagar etc. As on 31st March '99 the total length of roads were 771.5 Km. Out of the total length 298.50 Kms. of the roads were constructed/maintained by the P.W.D. ,138.85 Kms. by RWD 07.65 Kms. by forest, 247 Kms. by the G.R.E.F. In addition to state transport services, there are some private services also, which are plying in the town as well as in various villages in the district. All kinds of goods are generally carried by road transport where the road facility is available and commodities to interior villages are carried by the porters.

2. EDUCATIONAL DEVELOPMENT IN EAST SIANG DISTRICT

East Siang district is known as one of the most educated districts in the state. The first school was set-up by the local tribal people at Pasighat in the year 1918 after that some of the schools established before or during independent were Boleng (1940), Riga (1940), Balek (1946), Ledum (1947) etc. The medium of instruction was Assamese in all these schools during those days. The real development in the field of education started after the independence in 1951. By the time there were 5 (five) schools with 7 (seven) teachers and 462 students. According to 1971 Census, the literacy percentage of East Siang was 13 which ranked second amongst the five districts of the then NEFA. The male and female literacy rates were recorded 23.5% and 4.3% respectively which show negligible figures at national level. According to the State Statistics Report there were only 1 ((one) Nursery School, 158 junior Basic Schools (primary), 19 Middle Schools, 2 High Schools and 3 Higher Secondary schools in the East Siang district till 1971.

Table – 1: Positions of Educational Institutions in East Siang District (1971)

Sl. No.	Name of Educational Institutions	Total no. of Educational Institutions
1	Nursery Schools	1
2	Juniour Basic School (Primary)	158
3	Middle School (Upper Primary)	19

4	High School (Secondary)	2
5	Higher Secondary School	3
6	College	1
	Total	184

Source: State Statistics Report (1971)

From the Table-1 it can be understood that there has been a considerable progress in the district in case of educational institutions after the attainment of independence (1947).

Table-2: Distributions of Schools in different Blocks of East Siang district

S/No.	Block	Government					
		Pry.	Upper Pry.	Sec.	Hr. Sec.	KGBV	EGS
1	Pasighat	19	14	5	2	2	0
2	Ramle-Banggo	22	8	3	2	1	4
3	Mebo	15	9	2	2	2	6
4	Pangin	25	7	1	1	1	5
5	Ruksin	25	11	0	3	2	0
6	Riga	27	7	2	1	1	3
	Total	133	56	13	11	9	18

Source: SSA Rajya Mission, Itanagar.

From the Table-2 above, it can be assessed that there has been considerable progress in the district in case of educational institutions after the attainment of independence (1947). The table-2 depicts that there are 133 Primary, 56 Upper Primary, 13 Secondary and 11 Higher Secondary Schools in the East Siang district of Arunachal Pradesh respectively. It indicates the growth of educational institutions in the district.

In the district the numbers of educational institutions at the primary level is quite satisfactory but higher education is still lacking behind. Presently there are 133 Primary Schools, 56 Middle Schools, 13 Secondary Schools, and 11 Higher Secondary Schools according to the data obtained from the DDSE office Pasighat. Approximately 95% of Primary Schools are located in rural areas. To enhance the girl education in the district 9 (nine) Kasturba Gandhi Balika Vidyalaya centres are functioning in the district. Along with these districts has one Horticulture college, one DIET, two B.ed. colleges, one private college and one Government college. J.N. College is the oldest college in Arunachal Pradesh which is located at Pasighat town of the district. Recently in the year 2011 proposal was there to convert J.N College Pasighat into Arunachal University. In addition to that the district is having more educational institutions other than the government Organization. They are Vivekananda Kandriya Vidyalaya at Oyan, one Kendriya Vidyalaya at Pasighat and one B.K. Mission at Boleng and many more.

3.ENROLMENT OF STUDENTS AT ELEMENTARY LEVEL OF EDUCATION

Enrolment of students at any stage of education is very important for the growth and development of educational scenario of any state or nation. The numbers of students enrolled in the institutions indicate the educational awareness of the members residing in the

certain locality. East Siang district is one of the most advanced district in the field of education in the state of Arunachal Pradesh, if we compare the literacy rate of other district with that of East Siang district it remain as top three position which itself reflect its status.

Table-3: Enrolment of students at Primary level in East Siang district (2002-03 to 2011-12)

Years	Boys	Girls	Total
2002-03	5979	5383	11362
2003-04	7499	7028	14527
2004-05	7320	6459	13779
2005-06	8407	7520	15927
2006-07	9148	8310	17458
2007-08	9682	8950	18632
2008-09	9854	9138	18992
2009-10	9906	9180	19086
2010-11	10057	9287	19344
2011-12	7200	6767	13967

Source: SSA Rajya Mission, Itanagar.

Table-4: Enrolment of students at Upper Primary level in East Siang district (2002-03 to 2011-12)

Years	Boys	Girls	Total
2002-03	5984	4691	10675
2003-04	4276	4265	8541
2004-05	2600	2423	5023
2005-06	3136	2886	6022
2006-07	3495	3237	6732
2007-08	4096	3607	7703
2008-09	4171	3693	7864
2009-10	4298	3981	8279
2010-11	4372	4067	8439
2011-12	3251	2518	5769

Source: SSA Rajya Mission, Itanagar.

The Table-3 depicts the growth of enrolment at primary school stage from the years 2002-03 to 2011-12 after the arrival of SSA programme in Arunachal Pradesh as a whole and East Siang district in particular. From the table it is clear that during 2002-03 the total enrolment was found 11362 learners at primary schools stage in East Siang district with 5979 boys and 5383 girls respectively. The total enrolment of Class I to V increased from 11362 in the years 2002-03 to Whopping 19344 in the years 2010-11. However it was observed that there had been a slight decrease in enrollment of the learners in preceding years i.e 2011-12. The reasons 12 may be due to migration of the families and also admission of the learners in private schools.

The Table-4 reveals the total enrolment of upper primary level (CI-VI to VIII) from the year 2002-03 to 2011-12 in the East Siang district of Arunachal Pradesh. The table indicates that the total enrolment of learners in the East Siang district during the years 2002-

03 was 10675 with 5984 male and 4691 female learners respectively. In the years 2004-05 and 2005-06 the enrolment of learners were declined to a total enrolment of 5023 and 6022, after that it was substantially increased upto 2010-11 with a total enrolment of 8439 respectively. But again in the year 2011-12 the enrolment of the learners were decreased and it reached to a total enrolment of 5769 as shown in the table-4, the efforts have been made by the authority to enhance the enrolment of learners by providing incentives and free admission etc. to the students at elementary level.

Table-5: Gross Enrolment Ratio at Primary Level from the year 2002-03 to 2011-12

Year	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
GER	95.31	97.48	97.85	99.15	98.97	99.20	99.20
NER	90.00	97.78	97.20	98.86	83.88	83.70	83.70

Source: SSA Rajya Mission, Itanagar.

Table-6: Gross Enrolment Ratio at Upper Primary Level from the year 2002-03 to 2011-12

Year	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
GER	97.95	98.78	98.92	99.37	99.13	98.97	99.29
NER	95.00	98.78	97.05	98.95	98.54	77.36	97.04

Source: SSA Rajya Mission, Itanagar.

Further it is also important to note that as the substantial growth took place in GER at primary and upper primary levels, similarly an adequate growth has been observed in Net Enrolment Ratio (NER) from the year 2005-06 to 2008-09 at primary level, but during the years 2008-09 to 2011-12, the NER at primary level decreased which is shown in the Table-5 But according to the Table-6 at the upper primary level (Class-VI to VIII) NER increased from 95% to 97.04% in the year 2005-06 to 2011-12 which shows an increase of 2.04% in total.

4. STATUS OF TEACHERS IN EAST SIANG DISTRICT

The status of teachers is considered an important aspect of any educational system in any country or state. The best kind of curriculum / infrastructural facilities will not show the desirable results in the absence of adequate number of teachers and poor quality of teachers. Under the provision of SSA more number of teachers has recruited and after the recruitment the teachers have been provided training to enhance their competencies in taking up the teaching-learning process effectively at Primary and Upper Primary stage in East Siang district. The status of teachers at Primary and Upper Primary level has been shown in the Tables-5.10 and 5.11 respectively.

Table-7: Status of Teachers at Primary School Stage in East Siang district (2002-03 to 2011-12)

Years	Total	**UT	*TT	% of UT	% of TT
2002-03	273				
2003-04	365				
2004-05	365	216	149	59.17	40.83
2005-06	1133	713	420	62.93	37.07

2006-07	467	315	152	67.45	32.55
2007-08	562	410	152	72.95	27.02
2008-09	501	439	62	87.62	12.38
2009-10	1497	1435	62	95.24	4.76
2010-11	973	803	170	82.52	17.48
2011-12	724	656	68	90.61	9.39

Source: SSA Rajya Mission, Itanagar.

Table-8: Status of Teachers at Upper Primary School Stage in East Siang district (2002-03 to 2011-12)

Years	Total	**UT	*TT	% of UT	% of TT
2002-03	354				
2003-04	376				
2004-05	404	250	154	61.88	38.12
2005-06	498	323	175	64.85	35.15
2006-07	498	276	222	55.42	44.58
2007-08	519	397	222	57.22	42.78
2008-09	609	504	105	82.75	17.25
2009-10	609	504	105	82.75	17.25
2010-11	445	361	84	81.12	18.88
2011-12	568	391	177	68.83	31.17

*TT=Trained Teachers *UT=Untrained Teachers

Source: SSA Rajya Mission, Itanagar.

Table-9: Pupil Teacher Ratio (PTR) at Primary and Upper Primary School Stage in East Siang district (2002-03 to 2011-12)

Level	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Primary	1/41.62	1/39.8	1/37.75	1/14.06	1/37.38	1/33.15	1/37.91	1/12.75	1/19.88	1/19.29
U/Primary	1/30.16	1/22.72	1/12.43	1/12.09	1/13.52	1/14.84	1/12.91	1/13.59	1/18.96	1/10.15

Source: SSA Rajya Mission, Itanagar.

Table-10: Academic Qualifications of Primary and Upper Primary Teachers (including Para Teachers) in East Siang District

Academic Qualification	Male	Female	Total	Total Percentage (%)
Below Secondary	2	5	7	0.40
Secondary	32	39	71	4.09
Higher Secondary	255	189	444	25.60
Graduate	597	386	983	56.69

Post Graduate	150	74	224	12.92
M.Phil / Ph.D	5	0	5	0.22
Total	1041	693	1734	

Source: SSA Rajya Mission, Itanagar.

The Table-7 reveals that the number of teachers got increased from 273 to 1497 in the years 2002-03 to 2009-10 respectively at the primary level in East Siang district of Arunachal Pradesh. However, the number of teachers got reduced a little in the years 2010-11 and 2011-12 because of the retirement of some numbers of teachers at primary level. The another factor is the promotion of teachers at primary level from Assistant Teacher (AT) to Junior Teacher (JT) after getting B.Ed degree and placed at Upper Primary/ Secondary school level. The table indicates that there were 59.17%, 62.93%, 67.45%, 72.95%, 87.62%, 95.24%, 82.52% and 90.61% untrained teachers in East Siang district from the year 2004-05 to 2011-12 respectively. It is really a matter of concerned that the number of untrained teacher is increasing year after year in the concerned district as shown in the table-7. It is because of the newly recruited untrained teachers as there were no trained teachers available and consequently some around 90% teachers were found untrained at primary level in the concern district. The authority should take initiative to give more in-service training to these untrained teachers and inducting more training to give quality education in the primary schools of East Siang district in particular and Arunachal Pradesh as a whole.

Similarly the Table-8 shows the status of teacher at upper primary level in East Siang district from the year 2002-03 to 2011-12. The table-8 reveals that the number of teachers increased from 354 to 568 during the years 2002-03 to 2011-12 respectively and it may be considered as a substantial increase in the number of teachers at upper primary level. The Table-8 shows that in the year 2002-03 the number of teachers were 354 in total and after that its number increased significantly and almost double by the year 2008-09 and 2009-10. The reason may be the due to the recruitment of teacher under SSA which brings incredible development in the field of Elementary school level. In the year 2011-12 the total number of teacher has been raised upto 568 at upper primary school stage in the East Siang district which is very encouraging for the parents and school going children. Besides this, it is also a matter of grave concern that despite of having adequate number of teachers in upper primary schools there found some schools in the district which are running without having adequate subject teachers especially of the science and mathematics. The percentages of the untrained teachers at upper primary level were found 61.88%, 64.85%, 55.42%, 57.22%, 82.75%, 82.75%, 81.12% and 68.83% from the year 2004-05 to 2011-12 respectively. Some around 70% teachers were found untrained and 30% teachers have been found trained, therefore the focus need to be put on teacher training to give quality education in the district.

Further the Table-9 shows the Pupil Teacher Ratio for primary and upper primary schools from the year 2002-03 to 2011-12 in East Siang district. The Table-9 indicates that the Pupil Teacher Ratio were found 1:41.62 and 1:30.16 in the year 2002-03 at primary and upper primary level respectively. After the arrival of SSA in the district the number of

teachers increased substantially at primary and upper primary levels, consequently the pupil Teacher Ratio came down to the level of 1:19.29 and 10:15 at primary and upper primary school stage in the concerned district.

Similarly the Table-10 reveals the academic qualifications of primary and upper primary teachers (including Para Teachers) in East Siang district. According to the table 0.40% of the teacher serving in the Elementary schools of East Siang district, were having academic qualifications below secondary level. Out of the total Elementary level teachers 56.69% were graduated persons and 12.92% teachers were having post graduated in their academic qualifications. It is also very interesting that there were 0.22% of Elementary school teachers serving in the district who were having M.Phil / Ph.D degree.

5. ACADEMIC PERFORMANCE OF LEARNERS

Academic performance of learner is one of the main important indicators of the status of education at any stage. To study the academic performance of East Siang district investigator has collected the academic score of 6th and 8th grade learners from 15 schools through simple random sampling and the mean score were calculated accordingly. The computed score were tabulated and interpreted below:

Table-11: Showing the academic performance mean scores (out of total 100 marks) of 6th grade learners in different subjects.

Subjects	Sample Selected	Gender	Mean Score of learners academic performance
English	313	Boys	44.91
	250	Girls	45.42
Hindi	313	Boys	39.8
	250	Girls	43.3
Math's	313	Boys	36.13
	250	Girls	34.5
Science	313	Boys	39.16
	250	Girls	42.02
S/science	313	Boys	41.49
	250	Girls	42.06

Source: Data collected from Primary source.

The academic performance of the learners indicated in table- 11 and 12 depicts that in both the grade (6th and 8th) learners' performance are not quite satisfactory for boys and girls. The tables also show that the academic performance of learners in mathematics subject for both boys' and girls' 8th grade learners are very poor. It is a matter of grave concern that the academic performance means scores of both genders never touch even the 50 out of total 100 scores in grades 6th and 8th in any subject. It is quite clear from the table-11 and 12 that the boys and girls learners are almost performing equally at the elementary stage of education in East Siang district of Arunachal Pradesh in terms of their academic performance.

Table-12: Showing the academic performance mean scores (out of total 100 marks) of 8th grade learners in different subjects.

Subjects	Gender	Sample	Selected	Mean Score of learners academic performance
English	Boys	286		41.95
	Girls	230		40.84
Hindi	Boys	286		40.4
	Girls	230		40.67
Math's	Boys	286		28
	Girls	230		26.89
Science	Boys	286		37.71
	Girls	230		34.28
S/science	Boys	286		38.83
	Girls	230		40.19

Source: Data collected from Primary source.

The academic performance of the learners indicated in table- 11 and 12 depicts that in both the grade (6th and 8th) learners' performance are not quite satisfactory for boys and girls. The tables also show that the academic performance of learners in mathematics subject for both boys' and girls' 8th grade learners are very poor. It is a matter of grave concern that the academic performance means scores of both genders never touch even the 50 out of total 100 scores in grades 6th and 8th in any subject. It is quite clear from the table- 11 and 12 that the boys and girls learners are almost performing equally at the elementary stage of education in East Siang district of Arunachal Pradesh in terms of their academic performance.

6. MAJOR OBSERVATIONS OF THE ABOVE ANALYSIS & INTERPRETATION

The major observations of the above given tables and discussions shows that:

- i.) It is evidence from the above given tables and discussions that the numbers of schools in East Siang district of Arunachal Pradesh is increasing substantially at all stages from primary to higher secondary level.
- ii.) The pupil teacher ratio both at primary and upper primary level is quite appreciable and the enrolment of the learners at both primary and upper primary level of education is also satisfactory.
- iii.) There are large numbers of untrained teachers serving both at primary and upper primary level of education in the district which is a matter of grave concern for the authority.
- iv.) The academic qualifications of the teachers are at satisfactory level as most of the teachers are graduates and many post graduate teachers are also serving in the district at elementary level. But at the same time professional qualifications of the teachers should be ensure to keep more trained teachers to deal with the students in a better way in the schools.
- v.) The academic performance of the learners is not quite satisfactory. It needs improvement and thorough inquiry to know the reason behind low academic performance of learners in every subject. Indebt study and appropriate steps should be initiated to improve the

academic performance of the learners; especially in case of mathematics subject it needs immediate attention from the part of concern authority to find out the reason behind very poor academic performance in this particular subject.

7. CONCLUSION

From the above discussions, it can be concluded that in the East Siang district of Arunachal Pradesh the status of elementary education needs improvement in many areas. It is a matter of good indication that the number of schools are increasing but at the same time many untrained teachers are also serving in the various schools of the district. To enhance the status of elementary education in East Siang district of Arunachal Pradesh it needs cooperation and joins efforts from every angle of the society.

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